


# Memo

date: September 16, 2002

to: T. Sheridan

from: R. Casey 

subject: BAF ARR

Attached is the final report of the accelerator readiness review that has been performed for the Phase I commissioning of the Booster Applications Facility. This review is in response to your request of May 9, 2002. This review was conducted in compliance with the provisions of DOE Order 420.2, *Safety of Accelerator Facilities* and the Brookhaven National Laboratory Accelerator Safety Subject Area.

It is the consensus of the ARR Team that the Collider Accelerator Department has conducted a comprehensive review and all provisions of the SAD necessary for Phase I commissioning are being addressed. Adequate controls and policies will be in place to extract and transport beam safely from the Booster to the stop beyond the target room. A number of procedures and actions have not been completed at the time of this review that will need to be in place prior to the start of commissioning. This Team will monitor progress in completing these items.

A closeout memo will be forwarded to you following our verification that all items identified in the attached have been resolved.

Please let me know if you have any questions.

cc. E. Lessard (w/attachment) ✓  
P. Kelley - DOE Facility Representative (w/attachment)  
H. Kahnhauser (w/o attachment)  
M. Davis - ARR Team Member (w/o attachment)  
T. Monahan - ARR Team Member (w/o attachment)  
S. Stein - ARR Team Member (w/o attachment)  
J. Wishart - ARR Team Member (w/o attachment)

Attachment

ARR for BAF Phase I Commissioning

**Booster Applications Facility**

**Accelerator Readiness Review**  
**Phase I Commissioning**

*September 9, 2002*

## Signature Page

A committee, consisting of the personnel listed below, was charged by the Deputy Director of Operations on May 9, 2002 to perform an Accelerator Readiness Review (ARR) of the Booster Application Facility. This review will be conducted in three parts:

1. Beam line commissioning consisting of extraction of the beam from Booster and transport to the BAF beam stop
2. Commissioning of the experimental program
3. Routine Operation.

This review is for phase 1 and was conducted in compliance with the provisions of DOE Order 420.2, *Safety of Accelerator Facilities* and the Brookhaven National Laboratory Accelerator Safety Subject Area.

Committee member signatures below denote concurrence with findings and recommendations identified in this report.

Casey, Robert (NSLS)

Handwritten signature of Robert Casey in cursive script, written over a horizontal line.

Davis, Mark (ES):

Handwritten signature of Mark Davis in cursive script, written over a horizontal line.

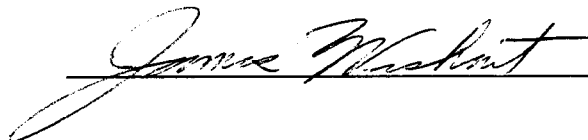
Monahan, Terry (SHS):

Handwritten signature of Terry Monahan in cursive script, written over a horizontal line.

Stein, Steve (QP&SO):

Handwritten signature of Steve Stein in cursive script, written over a horizontal line.

Wishart, Jim (CO)

Handwritten signature of Jim Wishart in cursive script, written over a horizontal line.

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2. Memo dated 2/15/02, D.I. Lowenstein to T. Sheridan, "Request for Two ARRS"  
including Commissioning Plans
3. The ARR Plan of Action for the Phase I Review
4. CAD Presentation at Opening Meeting
5. Summary Reports of ARR Team Members

## Executive Summary

The Accelerator Readiness Review Team for the start-up of the Booster Applications Facility (BAF) was appointed by the Deputy Director for Operations on May 15, 2002. (see Appendix 1) The readiness review of BAF will be performed in three distinct phases: 1) initial extraction from Booster and transport to the BAF target room; 2) commissioning of the experimental program; and 3) routine operations. The *Plan of Action* describing the ARR approach for the review of phase I (extraction and transport) is attached as Appendix 2 and was prepared, in compliance with the Implementation Guide for DOE Order 420.2, Safety of Accelerator Facilities and the BNL Accelerator Safety Subject Area.

The ARR process started on July 27, 2002 with a BAF status presentation made by CAD. (Appendix 3) The ARR Committee then began the Phase I evaluation of the facility through document review, interviews, and facility inspections. Appendix 4 provides a series of summary reports outlining the results of these reviews.

It is the consensus of the ARR Team that the Collider Accelerator Department has conducted a comprehensive review and all provisions of the SAD necessary for Phase I commissioning are being addressed. Adequate controls and policies will be in place to extract and transport beam safely from the Booster to the stop beyond the target room. A number of procedures and actions have not been completed at the time of this review that will need to be in place prior to the start of commissioning. This Team will monitor progress in completing these items and will recommend approval once all issues have been closed.

## **Introduction**

### **Background**

The Booster Applications Facility has been built at BNL with support from NASA and is planned as a national facility for research on the biological effects of high-energy high Z particles. Radiation fields encountered in space may cause deleterious effects in humans; such effects are of special concern for prolonged space missions beyond the protective magnetosphere of earth. Before such missions can be undertaken, a much more detailed understanding of these effects is required to allow planning and implementation of protective countermeasure. The variety of light and heavy ions that can be transported to BAF will permit radiation effect studies for the Space Program. It is anticipated that important information related to future travel in outer space will be obtained from research at this facility.

The Booster Applications Facility consists of an extraction system in the Booster ring followed by a beam line, target area and beam stop, with adjacent experimental and utility support buildings. A pulse of ions in the Booster ring is extracted into the Booster Applications Facility over periods up to 1 second in length. This pulse duration is termed "slow" extraction.

The Booster has operated since 1991 as a fast beam-injector of protons and heavy ions into the AGS. In order to deliver an external slow extracted beam to the Booster Applications Facility, new equipment was installed and some rearrangement of existing apparatus occurred. A new transport line was installed connecting the Booster ring to the BAF target room and beam stop. A Safety Assessment Document was prepared which defines the hazards involved and establishes the safeguards and controls needed to reduce potential hazards to an acceptable risk. This document has been previously reviewed and accepted by the Collider Accelerator Department and the Laboratory ESH Committee.

### **Organization**

The operation of the BAF facility is the responsibility of the Collider Accelerator Department and is subject to CAD requirements for the commissioning and routine operation. The CAD Department Chair is responsible for the conduct of the Phase I commissioning efforts. A liaison physicist assigned to the BAF is responsible for the development of the radiological fault study plan that will define the activities to be conducted during the commissioning period. The CAD Radiation Safety Committee has been responsible to review and approve the safeguards and operational requirements associated with Phase 1 operation. The CAD Accelerator Safety Systems Review Committee has been responsible to review the general safety issues associated with the equipment and facility. CAD Control Room personnel will initiate compliance with the Phase I commissioning subject to the requirements established by the BAF Accelerator Safety Envelope and the Fault Study Plan. Standard CAD procedures define the steps that must be completed prior to the initial extraction and transport of the beam to the BAF target room and beam stop.

## Scope

The scope of the ARR Team's charge is to determine if the CAD has completed all requirements and is prepared to safely extract a beam from the Booster ring to the BAF beam stop. The conduct of this review is based on BNL requirements and DOE Order 420.2, "Safety of Accelerator Facilities" and the associated Implementation Guide. It should be noted that the ARR process is not designed to evaluate the adequacy of the SAD; but is intended to confirm accomplishment of commitments made in the SAD and associated documents.

In order to reach a readiness determination for the extraction of beam and delivery to the beam stop, the ARR Team assessed the following topics:

1. Adequacy of commissioning plan, including the fault study to be conducted during phase
2. Status of access control and interlock systems
3. Operational procedures
4. Status of training & qualification for new procedures
5. Status of SAD commitments for:
  - Shielding
  - Beam stop
  - critical devices
  - access control
  - radiation monitoring
  - fire protection systems
  - ground water protection
  - tunnel purge fan
6. Status of BORE and ORE findings

## ARR Team

The ARR team consisted of five members - their affiliation and primary areas of review are listed below. The primary Point of Contact for the CAD was Ed Lessard.

Name	Affiliation	Primary Responsibility
R. Casey (Chair)	NSLS Department	Radiological
M. Davis	Environmental Services Division	Environment & Maintenance
T. Monahan	Safety & Health Services Division	Interlock Safety
S. Stein	Quality Programs & Services Office	Training & Quality
J. Wishart	Chemistry Department	Operational

P. Kelley from the local Brookhaven Area Office of the DOE participated as a team member in the review and provided DOE oversight of the process and findings.

Specific areas assigned to each team member are shown in Table I below:

Table I

BAF ARR Assignments <sup>1</sup>					
	Casey	Davis	Monahan	Stein	Wishart
Safety Assessment Document	a	a	a	a	a
Commissioning Plan	x	a	a	a	a
Beneficial Occupancy and Operational Readiness Evaluations		a	x		
Conduct of Operations	a	x	a	x	a
Interlock Plan	a		x		a
Maintenance Plan	a	x	a		
Training Plan	a	x	a	x	a
Operational Procedures	a	a	a	x	a
Accelerator Safety Envelope	x	a	a	a	x
Quality Assurance Plan				x	
Environmental Issues		x			
Interviews	x	x	x	x	x
Field verification	x	x	x	x	x

<sup>1</sup> An "x" indicates that the designated individual has primary responsibility for evaluation of the programmatic area. An "a" indicates that the individual has a secondary responsibility in that topic and will only evaluate selected portions of the designated program or document.

The review officially began on July 29, 2002 with an introductory presentation provided by CAD personnel (see appendix 2). The majority of interviews and inspections were conducted during the period August 3 – 16, 2002.

Guidance for the ARR process was provided by DOE Order 420.2 Safety of Accelerator Facilities; the draft Accelerator Safety Implementation Guide and the BNL SBMS Subject Area on Accelerator Safety.

## Conclusions

It is the consensus of the ARR Team that the Collider Accelerator Department has conducted a comprehensive review and all provisions of the SAD necessary for this phase have been incorporated into facility and department practice. Adequate controls and policies will be in place to extract and transport beam safely from the Booster to the stop beyond the target room. *Accelerator Readiness Summary Reports* were prepared by each ARR team member and are attached in appendix 4. At the time of this review a number of procedures and actions have not been completed that will need to be in place prior to the start of commissioning. The summary reports identify a number of pre and post start issues that will need to be addressed by CAD management which are listed in Observation Section below. CAD management is well aware of the open issues.



Brief summaries of principal topic areas are provided below.

The **BAF Safety Assessment Document (SAD)** has been prepared and approved by CAD and Laboratory ESH Committees.

A **BAF Accelerator Safety Envelope** has been prepared and approved by CAD management. This document has also been reviewed and accepted by Laboratory management and it has been informally discussed with the DOE site office. Formal approval of the ASE by DOE awaits completion of this ARR. It is understood that the ASE is acceptable to DOE and that there are no issues that prevent approval following completion of this ARR. Implementing procedures have been drafted for control room and other staff to ensure compliance with the ASE requirements.

A **BAF commissioning plan** has also been prepared and approved by CAD management. This document defines the elements necessary for the phase 1 commissioning of BAF. The "Commissioning and Acceptance Plan for Operation of the Booster Application Facility", 2/15/02, is a valid acceptance plan but contains no information about the actual activities to be performed during the commissioning phases. As such, it currently provides administrative responsibilities pursuant to readiness for review. However, it does not serve the full role of a commissioning plan, which should outline the tasks involved in start-up of the facility and include the fault study plan. A succinct outline of activities (<http://www.rhichome.bnl.gov/AGS/BAF/Commissioners/bafstartuptasks.html>) already exists for the CAD staff performing the commissioning. These tasks should be described in non-specialist's terms and combined with the fault study plan.

**The Fault Study Plan** for the commissioning has not been prepared as yet. Responsibility for the plan has been assigned and completion and approval of the plan will be an item in the Radiation Safety Committee (RSC) Checklist. The RSC checklist contains all items identified in the RSC review of BAF and as defined in CAD procedures, must be completed prior to CAD approval to extract beam into the BAF transport line.

**Access Control** has been addressed in the BAF SAD. During the phase I commissioning, control of access to the transport tunnel is paramount. Draft procedures have been prepared which ensure that no one is in the beam-path area when the accelerator is enabled by performing a hardware-enforced sweep of the area. However, all of these procedures were in draft form at the time of the review and must be approved and issued by CAD management prior to Phase 1 commissioning.

Review of the BAF Interlock/Access Control system has verified that due diligence was employed in the design and implementation of the BAF Interlock/ Access Control system. C-A staff members involved in this process are very knowledgeable with years of experience in development and implementation of Interlock/Access Control systems. The PEER 27 and associated documentation comply with BNL Standards providing an appropriate level of protection for personnel.

The **shielding** specified in the SAD for the berm, beam stops and labyrinths has been provided. The fault study to be conducted during the Phase I commissioning will examine the adequacy of the shielding as calculated in the SAD. The area atop the BAF transport line berm has been defined in the BAF SAD as a controlled area and a commitment was made to fence and post this area. The fence has not been installed as yet and will need to be completed prior to approval to begin Phase I commissioning.

**Interlocked area monitoring** is required for the BAF facility and will need to be in place prior to commissioning. Five chipmunks have been committed to the BAF facility and will be installed:

- On the berm above the target room
- In the labyrinth leading to the BAF laboratories
- In the labyrinth leading to the truck access
- 2 in the spur tunnel

The 2 in the spur tunnel are deployed to monitor radiation levels when there is personnel access to that area and booster is operating. It is not planned that these 2 monitors will interlock beam when the BAF area is secured. The other three monitors are a part of the BAF security system and will trip the BAF critical devices in an alarm state. The circuitry for these systems is installed and available, the chipmunks have not been deployed as yet.

A detailed review of **environmental considerations** was conducted during the ARR. The C-A Department has committed to a variety of controls to mitigate the potential for ground water contamination, even though tritium levels in the cooling water will be much less than the Drinking Water Standard. Hardware, engineered controls and administrative processes are in place to maintain and monitor these controls. Three recommendations are made below relating to environmental issues.

**Emergency preparation** for the commissioning was evaluated. During commissioning, BAF will be considered as another beam line and existing C-A procedures will be utilized. Activities related to BAF are being coordinated and controlled in an adequate manner. Several modifications to current procedures remain to be done and are noted below.

Laboratory policy requires that all new facilities undergo a series of **occupancy evaluations** to ensure that no significant safety issues are present and that Laboratory requirements for the building are incorporated. Various safety related reviews/inspections have been made of the BAF structures. At least three Beneficial Occupancy Readiness Evaluations (BORE) were performed by C-A and SHSD. BOREs are performed to ensure compliance with appropriate building codes and safety regulations as an organization begins to occupy a structure but not to begin operations.

In addition, internal C-A groups also evaluated issues at the BAF. A number of pre-start issues identified during these inspections remain open (e.g., fire detection and suppression systems have not received required certification). A number of internal C-A safety committee evaluations (ASSRC, ESRC & RSC) identified issues that also remain open. Pre-start issues identified

during the BOREs and from the various internal reviews must be closed out prior to permission being granted for commissioning.

In addition, a final Operational Readiness Evaluation (ORE) is required prior to commissioning by Laboratory policy. Prior to commissioning, all BAF areas (Bldgs. 956, 957 & 958) require an Operational Readiness Evaluation. All pre-start findings from this process must be resolved prior to commissioning.

**Maintenance activities** as they relate to BAF commissioning were reviewed and found to be coordinated and controlled in accordance with established C-A policies and procedures.

The **Personnel Qualification Requirements** for the operations staff have been described in the various facility documents. The CAD has a comprehensive program for qualification of responsible personnel. Training and qualification of personnel responsible for the Phase 1 Commissioning is awaiting completion of new procedures and other program documents.

### **Recommendations**

A number of safety and operational issues were open at the time of the ARR Team review and will need completion prior to BNL approval to begin commissioning. All items identified as pre-start will require verification by the ARR team.

#### **Prior to Phase I Commissioning**

1. The Fault Study Plan for the Phase I Commissioning must be completed and approved.
2. As a part of the fault study plan, an outline of tasks to be performed during the phase I commissioning should be included. In addition, a list of qualified personnel responsible for the conduct of the Phase I commissioning should be established. Documentation of training should be provided to the ARR team.
3. Pre-start issues identified during the BOREs and from the various internal reviews must be closed out prior to commissioning. Prior to commissioning, all BAF areas (Bldgs. 956, 957 & 958) require an Operational Readiness Evaluation (ORE). All pre-start findings from the ORE will need to be added to the current CAD listing of open issues for the BAF and closed prior to commissioning. There are a number of critical items which the ARR will need to verify prior to recommending approval to the Deputy Director for Operations, for example:
  - BAF area sweep procedures and training for personnel.
  - Completion of testing of all installed hardware/software interlock functions
  - Deployment and testing of all area radiation monitoring
  - Completion of all Radiation Safety Committee recommendations
  - Listing of BAF related alarms incorporated into Main Control Room system and documentation that operations personnel have been informed of new additions
  - Fencing of the area atop the BAF transport line and target room

4. The discharge path of the cooling tower blowdown must be clearly established. If it is determined that the discharge is routed to the sanitary system, have ESD evaluate acceptability.
5. The following administrative items should also be completed prior to beginning of Phase I commissioning:
  - hazard placards in place,
  - Fire/Rescue Run cards updated,
  - Tier I inspections for BAF scheduled
  - Add inspection of BAF cap to RSC checklist for initial commissioning
  - Revise C-A Department on-line listing of LECs to include those for BAF Buildings 956, 957 and 958

### **Prior to Routine Operation**

6. C-A should evaluate BAF access control indicators and controls in the MCR for Human Factors issues.
7. The FUA's for buildings 956, 957, and 958 should be revised.
8. The tritiated water collection tank in Bldg. 957 should be registered with Suffolk County as exempt.
9. The function of animal room floor drain covers should be established. In particular, CAD should determine if the covers should be included in the EMS process assessment and if configuration controls to ensure covers are in place before specific activities performed.  
**(Prior to commissioning experimental equipment)**

### **Readiness Determination**

The ARR team has determined that the CAD has conducted comprehensive reviews of the BAF facility and has taken steps to incorporate all commitments made in the BAF SAD into the facility and operational programs. However, a number of issues remain open at the time of this review – therefore, the recommendation to approve the start of Phase I Commissioning awaits verification of closure of these items. The Team will monitor progress at the facility until all issues identified in this report have been verified, and will provide a follow-up letter to the Deputy Director at that time.


## **Appendix 1**

**ARR Team Appointment Memo dated 5/9/02 from Deputy Director for  
Operations**

**BROOKHAVEN**  
NATIONAL LABORATORY

managed by Brookhaven Science Associates  
for the U.S. Department of Energy

# Memo

*date:* May 9, 2002  
*to:* D. I. Lowenstein  
*from:* T. Sheridan   
*subject:* Request for Two Accelerator Readiness Reviews

As requested in your memorandum of February 15, 2002, I have appointed an Accelerator Readiness Review Team. This team will participate in the two reviews for the Booster Applications Facility (BAF), the operation of the TTB Line with Low Mass Ions, and the Operation of RHIC with Deuterons. The team will consist of five individuals:

W. R. Casey, NSLS, Chairman of the ARR Team  
J. Wishart, Chemistry  
M. Davis, ESD  
T. Monahan, SHS  
S. Stein, QA

The ARR's will be conducted in accordance with the SBMS subject area concerning Accelerator Readiness Reviews.

## Attachment

CC: M. Butler  
P. Kelley  
E. Lessard  
ARR Team

## **Appendix 2**

**Memo dated 2/15/02, D.I. Lowenstein to T. Sheridan, "Request for Two  
ARRS" including Commissioning Plans**



Building 911  
P.O. Box 5000  
Upton, NY 11973-5000  
Phone 631 344-4611  
Fax 631 344-5954  
Lowenstein@bnl.gov

managed by Brookhaven Science Associates  
for the U.S. Department of Energy

*date: Friday, February 15, 2002*

*to: T. Sheridan*

*from: D. I. Lowenstein*

*subject: Request for Two Accelerator Readiness Reviews (ARRs)*

## Memo

The C-AD is requesting that you commence two ARR's on the dates given below. We feel the same ARR team could handle these two ARR's efficiently. The two accelerator readiness reviews are for:

ARR 1 - Commissioning and Operation of the Booster Slow Extraction, Booster Dump/Catcher at D Section, Booster Applications Facility (BAF) Beamline and Target Area Using Beams From Either Linac or TVDG, and Commissioning and Operation of BAF Support Buildings

ARR 2 - Operation of TTB Line With Low Mass Ions and Operation of RHIC With Deuterons

ARR 1 should begin August 1, 2002. I note that for the purpose of allowing sufficient time for the ARR Committee's validation effort, two separate commissioning modules and one operations module are envisioned for ARR 1:

- The first ARR 1 module should start August 1, 2002 and is for achieving readiness for Booster Slow Extraction, Booster Dump, and BAF Line commissioning. It is planned that the ARR committee complete their report on or about September 1, 2002.
- The second ARR 1 module should start January 1, 2003 and is for commissioning experimental equipment at the BAF. It is planned that the ARR complete their report for this module on or about February 1, 2003.
- The third ARR 1 module should start March 1, 2003 and is for achieving readiness for routine operation of Booster Slow Extraction, Booster Dump and the BAF with associated experiments. It is planned that the ARR complete their final report on or about April 1, 2003.

I attach the BAF Commissioning and Acceptance Plan that contains more detail about our Departmental approach to preparing for the ARR.



ARR 2 should begin September 1, 2002. The ARR should be able to review a limited set of changes to TVDG/TTB operations and recommend deuteron operation in TTB and RHIC by October 1, 2002. I plan on getting DOE approval for operation of TTB with low-mass ions and RHIC with deuterons by November 1. The limited changes to TTB/TVDG are upgraded shielding and upgraded engineered safety system for radiation protection. The documents that address deuteron-running mode are the draft Accelerator Safety Envelope (ASE) for TVDG/TTB and Unreviewed Safety Issue (USI) 3 for the TTB.

I attach the Acceptance Plan for operation with deuterons that contains more detail about our Departmental approach to preparing for the ARR.

The BAF SAD and draft ASE for BAF are available via the web, as are USI3 for TTB and the draft ASE for TVDG/TTB. These documents have been reviewed and recommended for approval by the Laboratory Environmental, Safety and Health Committee. I note that these documents have been previously forwarded to the DOE Brookhaven Area Office. They are available on the C-AD intranet and access privileges can be arranged for interested parties, who may be outside the firewall.<sup>1,2</sup>

\* \* \*

Copy to:

M. Butler  
P. Kelley  
E. Lessard  
A. McNerney  
P. Pile  
T. Roser

Attachments:

1. BAF Commissioning and Acceptance Plan
2. Acceptance Plan for Operation of TTB with Low Mass Ions and RHIC with Deuterons

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<sup>1</sup> [http://www.cadops.bnl.gov/AGS/Accel/SND/tvdg\\_ttb\\_usi.htm](http://www.cadops.bnl.gov/AGS/Accel/SND/tvdg_ttb_usi.htm)


<sup>2</sup> [http://www.cadops.bnl.gov/AGS/Accel/SND/baf\\_sad.htm](http://www.cadops.bnl.gov/AGS/Accel/SND/baf_sad.htm)

# **Commissioning and Acceptance Plan for Operation of the Booster Applications Facility**

**February 15, 2002**

**Prepared By**

**G. Marr and E. Lessard**

Approved By:   
Collider-Accelerator Department Chair

Approval Date: 2/15/02

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## **I. Introduction**

This acceptance plan describes necessary activities to be completed by the Collider Accelerator (C-A) Department prior to the ARR and commencement of commissioning and routine operation of the Booster Applications Facility (BAF). It is intended that this acceptance plan help the C-A Department prepare for an appropriate readiness review as required in DOE Order O 420.2, Section 5 b. An appropriate Accelerator Readiness Review (ARR) must be conducted following the declaration of readiness for commissioning or routine operations. The ARR report must support the decision by the DOE Field Office to approve the commencement of routine operations of the BAF and associated experiments.

This plan is intended to ensure the C-A Department avoids unsafe or environmentally unsound operations. It is noted that routine operation of the BAF may be concurrent with other operations; e.g., the fixed-target program in Building 912, or collider operations in the RHIC. From an operations standpoint, the BAF is viewed as a portion of a spectrum of operations in which machine physicists and shift-based operations personnel work out of a single Main Control Room (MCR) in Building 911. The role of the physicists and operators located throughout the complex is to achieve efficient, safe, and environmentally benign conveyance of protons or heavy ions in the machines and transfer lines during all operations.

C-A Department staff and Users are subject to the requirements of the Collider-Accelerator Conduct of Operations Agreement. The Conduct of Operations Agreement requires the on-duty Operations Coordinators be responsible for operation of the Collider-Accelerator complex. The operations staff consists of Operations Coordinators and Operators, as well as personnel from operations-support groups under their purview. Operations staff is trained, and only qualified personnel execute operation of the Collider-Accelerator complex. All authorizations, all permanent or temporary procedures, all Accelerator Safety Envelopes or Operational Safety Limits, and all responses to emergencies or occurrences must follow the formal processes identified in the Conduct of Operations Agreement. The BNL Directorate and the C-A Department management hold this understanding of the Conduct of Operations Agreement for the purposes of safe and environmentally sound operations.

Significant changes to Conduct of Operations, Training, Administrative or Technical Controls, Contingency Plans or the ARR process itself will be submitted as updates to this basic plan.

## **II. Scope**

The scope of this plan covers both commissioning and acceptance for routine operations. The plan is intended to help prepare the following for verification by the ARR:

- Procedures, administrative controls, and personnel training and qualification for commissioning as well as routine operations
- Engineered safety systems for the baf beam line and associated experimental facilities
- Specific facilities, sub-systems, and operations modes

Beam particles for the BAF will originate from either the Tandem or Linac accelerators, depending upon the need for heavy ions or protons. Transport lines then deliver beam to the AGS Booster synchrotron accelerator, which further accelerates the beam to an energy prescribed by the needs of the particular experiment. In the case of heavy ions, particles from one of the Tandem Van de Graaff accelerators (MP-7) will typically be reserved for providing gold ions to the RHIC during collider operations; the MP-6 Van de Graaff will provide heavy ions of various species to the BAF, or to service commercial experimenters at the Tandem experimental rooms in Building 901. For protons, the Linac provides protons to the Booster, for BAF and as a pre-accelerator to the AGS, concurrent with operations for BLIP. With either protons or heavy ions, bunched beam will be debunched in the Booster prior to extraction down the BAF line. The debunched beam pulse, up to 1 second in length, travels down the 100 m beam line to the target building, where experimenters will utilize the beam.

Controls for the beam will be via the Main Control Room. Installed safety systems will be similar in design to those used for the RHIC; these will be verified as ready prior to commissioning or routine operations. Safety systems include beam crash, access control subsystems, radiation monitors and critical devices; additional items, such as remote cameras and iris-scanning identity-verification have been added to facilitate frequent experimenter accesses to the target area. These are items previously used with NASA experiments in Building 912.

The facilities created for the BAF project include three new buildings:

- An experimental support building (building 958) that contains laboratory space as well as dosimetry control and communication with the MCR
- A power supply building (building 957) that contains magnet power supplies and instrumentation electronics for the beam line and associated cooling water systems
- The beam line tunnel, including entry labyrinths, target area and beam stop (building 956)

The BAF mode of operation will primarily use heavy ions of various species, but a proton operation mode will also be possible. In order to extract debunched beam from the Booster, new systems will be commissioned, including:

- A scheme for “Slow Extracted Beam” (SEB) from the Booster accelerator
- The Booster dump and catcher at the Booster D Section
- The BAF beam line and its associated magnets, power supplies, vacuum system, instrumentation and associated cooling water systems
- The BAF experimental area and systems for inserting samples at the target station, monitoring dosimetry and precisely controlling exposure of samples

With regard to beam operation and ion species, a schedule of the plan can be found in Figure 1 of the [March 2001 BAF Status Report](#). As shown by the plan it is anticipated that BAF commissioning with beam will begin during September and October 2002 with an additional commissioning period in April-June 2003, following installation of experimental equipment. Routine operations, as shown in the [Fiscal Years 2002-2006 Draft Operating Schedule](#), are anticipated for July 2003.

For the purpose of allowing sufficient time for the ARR validation effort, two separate commissioning modules and one operations module are envisioned:

- The first module for which an ARR is planned starts August 1, 2002 and is for achieving readiness for BAF commissioning; it is planned that the ARR committee complete their report on or about September 1, 2002
- The second module starts January 1, 2003 and is for commissioning additional experimental equipment; it is planned that the ARR complete their report for this module on or about February 1, 2003
- The third module starts March 1, 2003 and is for achieving readiness for BAF routine operation; it is planned that the ARR complete their final report on or about April 1, 2003

A [Safety Assessment Document](#) (SAD) for the BAF routine operation was submitted to BNL’s ESH Committee on May 10, 2001, and they recommended approval. A draft Accelerator Safety Envelope (ASE) for routine operations was also developed and presented to the ESH Committee, who recommended it be sent to the DOE Area Office. The Commissioning/Acceptance Plan, the approved SAD, and the draft ASE are intended to support the request that DOE approve routine operations following completion of the ARR.

### **III. Relevant Documents Available On-line**

- [BAF Safety Assessment Document](#)
- [Proposed BAF Accelerator Safety Envelope](#)
- [Collider-Accelerator Department Conduct of Operations](#)
- [Collider-Accelerator Department Operations Procedures](#)
- [Environmental Assessment for BAF](#)
- [Training and Qualification Plan](#)
- [Quality Assurance Procedures](#)
- [Configuration Management Plan for C-A Access Control System](#)
- [Procedure for Review of Shielding Design](#)
- [Procedure for Unreviewed Safety Issues](#)

### **IV. Conduct of Operations**

The [Collider-Accelerator complex](#) is made up of a number of facilities. It includes the [Tandem Van de Graaff](#), the Tandem to Booster (TTB) tunnel, the [Linac](#), the Booster, the BAF line, the Booster to AGS (BTA) tunnel, the AGS Ring and its [fixed-target experimental areas](#) including the Muon Storage Ring, the AGS to RHIC (ATR) tunnel, the [Collider](#) and the experiments at the intersection regions. During operations, all problems encountered (e.g., operational, safety, scheduling, etc.) in any of these areas are reported to the Operations Coordinator in the MCR. All staff will be working under the procedures and authorizations prescribed by the Collider-Accelerator Conduct of Operations.

The Operations Coordinator makes the necessary notifications or arrangements for operations or authorizations. All operations would have to be preceded by the appropriate authorizations where required. Required authorizations are indicated in the Collider-Accelerator Operations Procedure Manual, and on the check-off lists authorized by the Radiation Safety Committee, the Accelerator Systems Safety Review Committee and the Experiment Safety Review Committee.

All operations personnel must satisfy requirements for authorization in the following areas:

- Delegating C-AD chairman, division head or supervisor authorization
- Operating collider-accelerator systems
- Starting-up or restarting collider-accelerator systems
- Performing maintenance on collider-accelerator systems
- Producing, classifying or removing existing procedures
- Approving temporary procedures
- Signing-off changes to procedures
- Reviewing procedures
- Appending training and qualification listings

- Declaring “critical” systems; that is, systems that must be worked on when energized

During maintenance and shutdown periods, all scheduled operational related maintenance is done following the notification of the appropriate Divisional Maintenance Coordinator. All maintenance is performed via requirements set down in [ES&H Standard 1.3.6](#), Work Planning and Control for Operations, and executed at the Department level via [OPM 2.10](#), Maintenance Management Policy, [OPM 2.28](#), Enhanced Work Planning, and [OPM 2.29](#), Enhanced Work Planning for Experimenters.

## **V. Training**

It is the policy of the Collider-Accelerator Department to ensure general, facility-specific, and job-specific training of any C-A employee, visitor, contractor or experimenter who will require unescorted entry, into one or more of the buildings that form the Collider-Accelerator complex. Training is provided, to the level appropriate, to ensure conformance to the Collider-Accelerator Operations Procedures Manual in order to protect the environment, and to maintain the health and safety of personnel.

An examination system for training, which can be audited, is maintained by the Collider-Accelerator Department [Training Group](#).

Training courses are developed using performance-based training techniques, based on guidance from DOE's Training Accreditation Program (TAP) objectives. Training includes general BNL Rad Worker 1, C-A BAF facility-specific ESH training, and job-specific training for critical skills. Individuals, whether employees, guests or visitors complete specified training to maintain an acceptable level of performance required for safe, environmentally sound and efficient conduct of assigned duties.

Facility-specific ESH training is aimed at preparing individuals to enter either C-A accelerators and/or experimental areas, and is provided by the C-A Department. All individuals who may enter accelerators are required to take Collider-Accelerator Access Training. All Users who work in the experimental areas are required to take facility-specific Users Training. Study guides for facility-specific training programs are located at the [C-A ESHQ web site](#). The C-A Training Manager coordinates staff training. The [RHIC and AGS Users Center](#) provides training coordination and guest services for the experimenters.

Facility-specific training does not enable a person to work in a C-A facility. An additional determination regarding job-specific ESH training is required prior to authorizing work. Work Control Coordinators make this determination for each job they assign using the C-A Department work planning process (C-A OPM 2.28). For Users,



the Experimental Work Control Coordinator using a process described in C-A OPM 2.29 makes this determination.

In order for the Work Control Coordinators to verify personnel qualifications, the appropriate job-specific training for each C-A employee or User is assigned one or more Training Job Assessments. Each Job Training Assessment is linked to training course requirements that are listed in the [Brookhaven Training Management System](#) (BTMS). The BTMS can be searched by Work Control Coordinators to determine if an individual is qualified to perform the work. Additionally, the Access Control System will not allow Users to enter the BAF experimental area unescorted unless they have met training requirements.

BTMS job title relevant to routine operations of the BAF and experiments, and the minimum number of qualified personnel required to maintain operation of BAF, are:

- MCR Operations Coordinator, AD-510 (1 per shift)
- MCR Operator, AD-560 (1 per shift)
- Tandem Van de Graaff Operator if TVDG is used, AD-012/AD-014 (1 per shift)
- C-A Radiological Control Technician, RP-01 and AD-520 (1 per shift)
- Collider-Accelerator Support, AD-570 (1 per shift)

## **VI. Contingency Procedures**

It is not unreasonable to assume situations that employ equivalent safety or protection techniques may arise when operating facilities of this size.

Contingency procedures include a conventional but equivalent protection technique. One example is [C-A OPM 9.1.16](#), “Lock Out and Tag Out for Radiation Safety.” The C-A Department uses this formal procedure to maintain compliance with all applicable radiation standards in situations where a fully automatic access-control system is impractical. This C-A procedure provides instructions for liaison physicists, liaison engineers, members of the Access Controls Group, Operations Coordinators, and members of the C-A Radiation Safety Committee to follow in order to lock out and tag out equipment or beam lines for the purposes of radiation protection. C-A personnel who are members of our existing Conduct of Operations may employ this procedure whenever equipment or beam lines are to be locked out during barrier modifications or removals, or whenever the automatic access-control system alone does not provide the required protection.

Additional contingency procedures may be developed during the BAF commissioning period in order to ensure safe, environmentally sound and reliable execution of specific tasks.

## **VII. Commissioning and Routine Operation Modules**

Module for Commissioning BAF SEB, Persons Responsible and Scheduled Readiness  
Date

SCHEDULE: Commissioning of SEB to the BAF line on or about September 15, 2002.
DESCRIPTION: New Booster ring extraction equipment will be commissioned with beam ejected into the beginning of the BAF line. The Booster dump/catcher at Booster D Section and the beam dump at the end of the BAF line will be commissioned.
COMMISSIONING REQUIREMENTS (Persons Responsible): <ul style="list-style-type: none"><li>• All ASSRC and RSC items relevant to this commissioning module are closed out (W. Glenn, D. Beavis)</li><li>• Critical devices, beam current monitors and reach-backs for radiation protection have been established (D. Beavis)</li><li>• The access control system is operational and tested (A. Etkin, N. Williams)</li><li>• Emergency procedures are complete (R. Karol)</li><li>• Operations procedures are complete (P. Ingrassia)</li><li>• Fault Study Plan prepared (A. Rusek)</li><li>• RSC Check-Off List prepared (A. Rusek)</li><li>• ASSRC Check-Off List prepared (J. Hock)</li><li>• Accelerator Safety Envelope is complete (E. Lessard)</li><li>• Sweep procedures are complete (P. Ingrassia)</li><li>• Training records for operations staff are complete (J. Maraviglia)</li></ul>

Module for Commissioning BAF Experimental Equipment, Persons Responsible and Scheduled Readiness Date

SCHEDULE: Commissioning experimental equipment with heavy ions on or about April 1, 2003.
DESCRIPTION: Heavy ions will be transported to the BAF target station; experimental equipment and procedures will be tested.
<p>COMMISSIONING REQUIREMENTS (Persons Responsible):</p> <ul style="list-style-type: none"> <li>• Experimental Support Building is complete (D. Phillips)</li> <li>• ESRC, ASSRC and RSC items relevant to this commissioning module are closed out (A. Rusek, D. Phillips, Y. Makdisi, W. Glenn, D. Beavis)</li> <li>• The access control system is operational and tested for experimenter use (A. Etkin, N. Williams)</li> <li>• Emergency procedures for experiments are complete (R. Karol)</li> <li>• Experiment operations procedures are complete (A. Rusek)</li> <li>• Fault Study Plan prepared (A. Rusek)</li> <li>• RSC and ESRC Check-off Lists prepared (A. Rusek)</li> <li>• Accelerator Safety Envelope is complete (E. Lessard)</li> <li>• Sweep procedures are complete (P. Ingrassia)</li> <li>• Training records for relevant Users complete (J. Maraviglia)</li> </ul>

Module for BAF Routine Operations, Persons Responsible and Scheduled Readiness Date

SCHEDULE: BAF routine operations with beam on or about July 1, 2003.
DESCRIPTION: BAF will commence routine experimental running.
<p>ROUTINE OPERATIONS REQUIREMENTS (Persons Responsible):</p> <ul style="list-style-type: none"> <li>• All ESRC, ASSRC and RSC items relevant to routine operations are closed out (D. Phillips, A. Rusek, Y. Makdisi, W. Glenn, D. Beavis)</li> <li>• The BAF access-control system is operational and tested (A. Etkin, N. Williams)</li> <li>• Emergency procedures are complete (R. Karol)</li> <li>• Operations procedures are complete (P. Ingrassia)</li> <li>• RSC and ESRC Check-Off Lists prepared (A. Rusek)</li> <li>• ASSRC Check-Off List prepared (J. Hock)</li> <li>• Accelerator Safety Envelope is complete (E. Lessard)</li> <li>• Sweep procedures are complete (P. Ingrassia)</li> <li>• Facility specific training for users developed and implemented (P. Cirnigliaro)</li> <li>• Training records for operations staff complete (J. Maraviglia)</li> <li>• Training records for Users complete (J. Maraviglia)</li> </ul>

## **VIII. Technical and Administrative Controls**

A *technical control* is an act, service, or document used to satisfy a specific requirement stated in a *DOE Order or Federal Law* to ensure safety or protect the environment. Examples include the following:

- Safety Assessment Document
- Accelerator Readiness Review
- Accelerator Safety Envelope
- Radiological training requirements
- ALARA program for dose reduction
- DOE approval prior to commissioning and routine operations
- Shielding Policy as per DOE Order 420.2A

Technical controls are found in [DOE Order 420.2A “Accelerator Safety”](#), [10 CFR 835 “Occupational Radiation Protection”](#) and [DOE 5480.19 “Conduct of Operations Requirements for DOE Facilities”](#).

An *administrative control* is an act, service, or document used to satisfy a specific requirement stated in a *BNL or Department/Division policy* to ensure safety or protect the environment. Examples include:

- Experiment and accelerator design reviews for safety and environmental protection
- Safely-off modes, critical devices, and reach backs for radiation protection
- Access control procedures for operators
- Operations procedures
- Fault studies
- Sweep procedures
- Records to ensure training is completed
- Roles, responsibilities, authorities, and accountabilities document (R2A2s)
- Facility Use Agreements
- Work planning

Administrative controls are found in Brookhaven's [Standards Based Management System](#), [C-A Department Conduct of Operations Matrix](#), and [C-A Department Procedures](#).

### **Specific Technical Controls for BAF Commissioning and Operations**

- C-A Department Conduct of Operations Matrix
- BAF Commissioning/Acceptance Plan
- BAF Commissioning and Operations ARR Report
- DOE approvals for BAF Commissioning and Operations

- DOE approval of BAF Accelerator Safety Envelope
- BAF Environmental Assessment and FONSI
- BAF Safety Assessment Document
- ALARA procedures

#### Specific Administrative Controls for Collider Operations

- Configuration management plan
- Designation of critical devices by the Radiation Safety Committee
- ESH reviews by BNL and C-AD ESH committees
- Environmental management system requirements for the BAF
- Facility Use Agreements for BAF facilities
- Fault studies
- Functional tests of the BAF security system
- Laboratory management approval for BAF commissioning and operations
- Operational readiness reviews
- Operations procedures
- R2A2 documents
- Radiation Safety Committee check-off lists
- Experimental Safety Review Committee check-off lists
- Accelerator Systems Safety Review Committee check-off lists
- Radiation Work Permits
- Radiation monitor interlocks and main control room alarms
- Self-assessments, self-evaluations and C-AD management assessments
- Standards Based Management System requirements
- Sweep procedures
- Training documentation (BTMS)
- Work planning and work permits

#### **IX. List of New/Updated C-A Operations Procedures Required for BAF Commissioning and Operational Readiness (Person Responsible)**

(E. Lessard)

OPM 2.5.3, BAF Operational Safety Limits/Accelerator Safety Envelope

(P. Ingrassia)

OPM 4.56. Number to be determined, BAF Line Upstream (Z3) Sweep Checklist

OPM 4.56. Number to be determined, BAF Line Downstream (Z2) Sweep Checklist

OPM 4.56. Number to be determined, BAF Experimental Area (Z1) Sweep Checklist

(R. Karol)

OPM 3. Number to be determined, BAF Emergency Procedure

(N. Williams)

OPM 4. Number to be determined, BAF line (Peer 27) Security Gate Subsystem Check

OPM 4. Number to be determined, PASS Peer 27 Crash Subsystem Test

OPM 4. Number to be determined, Critical Response Subsystem Checklist for PASS – Peer 27

OPM 4. Number to be determined, Confirmation of Proper System Operation of PASS – Peer 27

Experiment Operating Procedures (A. Rusek)

OPM 11. Number to be determined, Operation of Experiment Sample Trolley

OPM 11. Number to be determined, Operation of Beam Degradar

OPM 11. Number to be determined, Operation of Overhead Crane

## X. Responsibility Matrix


Acceptance Plan Element	Person(s) Responsible	Training - Records, Coordination	Fault Study Plan	Commissioning Fault Study Review	Sweep Procedures	Operations Procedures	Emergency Procedures	Access Control System Review	Experiment Operating Procedures	Work Planning for Experimenters	Facility-Specific Training	RSC Checklists	ESRC Checklists	ASSRC Issues/Checklists	Accelerator Safety Envelope	Prior Open Items (e.g., ORR items from construction project)	Facility Use Agreements	EMS Documents for BAF
	A. Etkin		X	X				X									X	
	A. Rusek		X	X					X			X	X					
	B. Sutherland								X		X							
	H. Kahnhauser		X	X														
	D. Beavis							X				X						
	D. Phillips													X				
	E. Lessard					X									X			
	J. Maraviglia	X									X							
	P. Cirnigliaro									X	X							X
	R. Karol						X									X		
	J. Hock													X				
	M. Vazquez								X		X							
	N. Williams				X			X										
	P. Ingrassia				X	X												
	W. Glenn													X				
	Y. Makdisi								X				X					

**Acceptance Plan for Operation of the TTB Line With Low Mass Ions  
and RHIC With Deuterons**

**February 15, 2002**

**Prepared By**

**E. Lessard**

Approved By:   
Collider-Accelerator Department Chair

Approval Date: 2/15/02



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## **I. Introduction**

This acceptance plan describes necessary activities to be completed by the Collider Accelerator (C-A) Department prior to the ARR and commencement of routine operations of the TTB Line and RHIC with deuterons. It is intended that this acceptance plan help the C-A Department prepare for an appropriate readiness review as required in DOE Order O 420.2, Section 5 b. An appropriate Accelerator Readiness Review (ARR) must be conducted following the declaration of readiness for routine operations. The ARR report must support the decision by the DOE Field Office to approve the commencement of routine operations.

This plan is intended to ensure the C-A Department avoids unsafe or environmentally unsound operations. It is noted that routine operation of the TTB and RHIC with deuterons may be concurrent with other operations; e.g., the fixed-target program in Building 912. From an operations standpoint, deuteron operations is viewed as a portion of a spectrum of operations in which machine physicists and shift-based operations personnel work out of a single Main Control Room (MCR) in Building 911. The role of the physicists and operators located throughout the complex is to achieve efficient, safe, and environmentally benign conveyance of deuterons in the machines and transfer lines during all operations.

C-A Department staff and Users are subject to the requirements of the Collider-Accelerator Conduct of Operations Agreement. The Conduct of Operations Agreement requires the on-duty Operations Coordinators be responsible for operation of the Collider-accelerator complex. The operations staff consists of Operations Coordinators and Operators, as well as personnel from operations-support groups under their purview. Operations staff is trained, and only qualified personnel execute operation of the Collider-Accelerator complex. All authorizations, all permanent or temporary procedures, all Accelerator Safety Envelopes or Operational Safety Limits, and all responses to emergencies or occurrences must follow the formal processes identified in the Conduct of Operations Agreement. The BNL Directorate and the C-A Department management hold this understanding of the Conduct of Operations Agreement for the purposes of safe and environmentally sound operations.

## **II. Scope**

The scope of this plan covers acceptance for routine deuteron operations in the TTB and RHIC. The plan is intended to help prepare for the following specific issues that will be verified by the ARR:

- Procedures, administrative controls, personnel training and qualification relevant to routine operations with deuterons are in place
- Engineered safety system for radiation protection in the TVDG and in the TTB tunnel are approved by the RSC and tested
- Shielding changes for TTB are completed

- Use of deuterons in RHIC is within the parameters given in the existing RHIC ASE

It is noted that the upgraded engineered safety system for radiation protection at TTB/TVDG is similar in design to those used for the RHIC. The system includes beam crash, access control, radiation monitors and critical devices. Additionally, it is noted that the earth berm at TTB has been raised to meet a minimum thickness of three feet.

### **III. Relevant Documents Available On-line**

- [TVDG Safety Assessment Document](#)
- [TTB Safety Analysis Report](#)
- [Proposed TVDG/TTB Accelerator Safety Envelope](#)
- [Collider-Accelerator Department Conduct of Operations](#)
- [Collider-Accelerator Department Operations Procedures](#)
- [Unreviewed Safety Issue 3 for TTB](#)
- [Training and Qualification Plan](#)
- [Quality Assurance Procedures](#)
- [Configuration Management Plan for C-A Access Control System](#)
- [Procedure for Review of Shielding Design](#)
- [Procedure for Unreviewed Safety Issues](#)

### **IV. Conduct of Operations**

All staff will be working under the procedures and authorizations prescribed by the existing [Collider-Accelerator Conduct of Operations](#).

### **V. Training**

The existing system for training, which can be audited, is maintained by the Collider-Accelerator Department Training Group. Records are maintained in [BTMS](#).

BTMS job title relevant to routine operations and the minimum numbers of qualified personnel required for routine operation are:

- MCR Operations Coordinator, AD-510 (1 per shift)
- MCR Operator, AD-560 (1 per shift)
- Tandem Van de Graaff Operator, AD-012/AD-014 (1 per shift)
- C-A Radiological Control Technician, RP-01 and AD-520 (1 per shift)
- Collider-Accelerator Support, AD-570 (1 per shift)

### **VI. Operations Schedule**

Operating Items for TTB and RHIC Using Deuterons, Persons Responsible, and  
Scheduled Readiness Date

SCHEDULE: Operate TTB and RHIC with deuterons on or about November 1, 2002.
DESCRIPTION: New TTB/TVDG engineered safety equipment will be operated with deuteron beam in the TTB line. The shielding above the TTB line will have been raised to a minimum three-foot thickness. The RHIC will operate with deuterons.
<p>OPERATING REQUIREMENTS (Persons Responsible)</p> <ul style="list-style-type: none"> <li>• All related RSC items are closed out (D. Beavis)</li> <li>• Critical devices, beam current monitors and reach-backs for radiation protection have been established (D. Beavis)</li> <li>• The access control system is operational and tested (A. Etkin, N. Williams)</li> <li>• New sweep procedures are complete (C. Carlson, P. Ingrassia)</li> <li>• New TVDG operations procedures are complete (C. Carlson, J. Alessi)</li> <li>• Fault Study Plan prepared (J. Alessi)</li> <li>• RSC Check-Off List prepared (J. Alessi)</li> <li>• Accelerator Safety Envelope for TVDG/TTB is complete (E. Lessard)</li> <li>• Training records for operations staff are complete (J. Maraviglia)</li> <li>• Assure deuteron operations in RHIC are within RHIC ASE (A. Stevens, D. Beavis)</li> </ul>

**VII. List of New/Updated Procedures and/or Tasks Required for Operational Readiness (Person Responsible)**

(E. Lessard)

OPM 2.5.1, Operational Safety Limits for Tandem Van De Graaff

OPM 2.5.2, RHIC Accelerator Safety Envelope Parameters (Revised)

(P. Ingrassia)

OPM 4.56. Number to be determined, TVDG Sweep Checklist

OPM 4.56. Number to be determined, TTB Sweep Checklist

(N. Williams and A. Etkin)

OPM 4. Number to be determined, TVDG/TTB Security Gate Subsystem Check

OPM 4. Number to be determined, TVDG/TTB Crash Subsystem Test

OPM 4. Number to be determined, TVDG/TTB Critical Response Subsystem Checklist

OPM 4. Number to be determined, Confirmation of Proper System Operation of PASS for TVDG/TTB

(N. Williams and J. Alessi)

- Add harp and dual Chipmunk to limit beam current at TVDG

- Locate harp (or equivalent) to create  $\sim 15$  mrem/h at 100 nA
- Set Chipmunk interlocks at  $\sim 25$  mrem/h
- Limit field in bypass dipoles for beam from MP6 to TTB
  - Use equivalent method to limit beam energy from MP7 to TTB if MP7 is used
- Add dual set of door interlocks in the TVDG accelerator room
  - Mechanical equipment room
  - TVDG control room
  - Target Room 4
  - TTB gate
  - Downstairs electrical equipment room
  - Downstairs mechanical equipment room

(J. Alessi)

- Ensure TVDG operators are trained in new procedures
- Create operation procedures in OPM Chapter 12 to
  - Limit hourly average deuteron currents to 200 nA
  - Limit terminal voltage to 6 MV
  - Limit dc average current to 200 nA or less
  - Restrict deuteron source to be MP6 only
  - Respond to Chipmunk alarms and interlocks
  - Disable 2<sup>nd</sup> set of door interlocks in TVDG
  - Minimize use of Faraday cups in TTB

(D. Beavis and J. Alessi)

- Issues to be checked at TVDG by RSC
  - Redundant interlock string switched in for deuteron operations
  - Bypass-line dipole fields are limited
  - Beam intensity monitor is locked in the inserted position
  - Chipmunk interlocks are switched in
  - The target-room-opening shields for scattered beam are in
  - The shielding at beam opening to Target Room 1 is installed
  - Entry into a TVDG tank requires a check for contamination by RCT
  - A fault study at the NW corner of Tandem Control Room is performed and evaluated
  - A fault study near Rutherford Drive and TTB is performed and evaluated
  - The earth shield along TTB is 3 foot thick or more
  - Two beam stops have been added at low energy end of MP6
  - Two beam stops have been added at low energy end of MP7
  - Logic and testing of changes to ACS at TVDG/TTB have been reviewed and approved
  - New ACS wiring, logic and testing is documented
  - All changes to existing ACS are configuration controlled
  - The redundant ACS in TVDG is a QA1 system

## VIII. Responsibility Matrix

Acceptance Plan Element	Training - Records, Coordination	Fault Study Plan	Fault Study Review	Sweep Procedures	Operations Procedures	Access Control System Review	RSC Checklists	USI and ASE for TVDG/TTB	Assure Deuterons Within RHIC ASE
Person(s) Responsible									
A. Etkin						X			
H. Kahnhauser			X						
D. Beavis		X				X	X		X
J. Alessi		X			X		X		
C. Carlson				X	X				
E. Lessard								X	
J. Maraviglia	X								
N. Williams						X			
P. Ingrassia				X					
A. Stevens									X

## **Appendix 3**

### **The ARR Plan of Action for the Phase I Review**

## **Booster Applications Facility (BAF)**

### **Accelerator Readiness Review – Plan of Action**

**Objective:** The objective of this review is to evaluate the preparation at the Booster Applications Facility and to assure that the facility is prepared to operate in a safe and environmentally acceptable manner. The Accelerator Readiness Review (ARR) process will verify that necessary programs have been developed, that appropriate personnel have been assigned and trained, that operations and relevant procedures have been approved, and that safety significant systems and controls are in place. The ARR shall be performed consistent with the requirements of the BNL Accelerator Safety Subject Area and DOE Order 420.2. It should be noted that the ARR process is not designed to evaluate the adequacy of the SAD, but rather is intended to confirm satisfactory closure of commitments made in the SAD and associated documents.

**Methodology:** The ARR Team shall verify that operational and ESH program commitments and requirements have been satisfactorily addressed through review of documents, interviews with responsible personnel and facility walk-down. The programmatic areas to be evaluated and responsibilities of each team member are defined in Table I below. Each team member will provide a brief summary of their review for inclusion into the BAF ARR file.

Three Beneficial Occupancy Readiness Evaluations (BORE) managed by the Safety & Health Services Division were performed of the BAF facilities 956, 957 & 958. A final Operational Readiness Evaluation administered by the Collider Accelerator Department and augmented with independent ESH personnel will be conducted prior to the closure of the ARR Phase I evaluation. These evaluations are an important adjunct to the ARR process - closure of these findings will be verified during the ARR.

**Schedule:** The ARR will be conducted in three distinct phases:

1. Beam line commissioning consisting of extraction of the beam from Booster and transport to the BAF beam stop
2. Commissioning of the experimental program
3. Routine Operation.

A separate report addressed to the Deputy Director of Operations with recommendations and conclusions will be prepared for each phase.

Phase I of the ARR will begin the week of July 29, 2002. This phase of the ARR process is expected to be complete by August 30, 2002.

Phase II is expected to begin in January, 2003 and Phase III is expected to begin in March, 2003. It is planned to use the same team members for each phase to support continuity in the review.



**ARR Team Members:** Members of the ARR team and their primary responsibilities are as follows. A more detailed breakdown of the scope of each team member's work is provided in Table I.

<b>Name</b>	<b>Affiliation</b>	<b>Primary Responsibility</b>
R. Casey (Chair)	NSLS Department	Radiological
M. Davis	Environmental Services Div.	Environment & ConOp
T. Monahan	Safety & Health Services Division	Interlock Safety
S. Stein	Quality Management Office	Training & Quality
J. Wishart	Chemistry Department	Operational

P. Kelley from the local Brookhaven Area Office of the DOE will participate as a team member in the review and will provide DOE oversight of the process and findings.

Ed Lessard of the Collider Accelerator Department will be the primary point of contact for the ARR team.

**Table I**

<b>BAF ARR Assignments<sup>1</sup></b>					
	<b>Casey</b>	<b>Davis</b>	<b>Monahan</b>	<b>Stein</b>	<b>Wishart</b>
Safety Assessment Document	a	a	a	a	a
Commissioning Plan	x	a	a	a	a
Beneficial Occupancy and Operational Readiness Evaluations		a	x		
Conduct of Operations	a	x	a	x	a
Interlock Plan	a		x		a
Maintenance Plan	a	x	a		
Training Plan	a	x	a	x	a
Operational Procedures	a	a	a	x	a
Accelerator Safety Envelope	x	a	a	a	x
Quality Assurance Plan				x	
Environmental Issues		x			
Interviews	x	x	x	x	x
Field verification	x	x	x	x	x

The DOE participant will attend and partake in all portions of the review as desired.

<sup>1</sup> An "x" indicates that the designated individual has primary responsibility for evaluation of the programmatic area. An "a" indicates that the individual has a secondary responsibility in that topic and will only evaluate selected portions of the designated program or document.

## **Appendix 4**

### **CAD Presentation at Opening Meeting**

## BAF ARR Opening Meeting

### Commissioning/Acceptance of BAF

July 30, 2002

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## Readiness Philosophy

- Ideal: ARR begins when C-AD management has verified all aspects of readiness
- Practice: ARR is done in parts or in parallel with the C-AD's review process
- 420.2 Guide: "When the contractor's **senior management** determines that the activity is ready to be undertaken, this determination is to be formally communicated to the DOE"

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## DOE Accelerator Safety Guide

"The purpose of a **Commissioning** ARR is to verify readiness to proceed with commissioning (or the next phase of commissioning). The Commissioning ARR should confirm, to the **extent necessary** to safely proceed with commissioning (or the next phase of commissioning), that construction is **sufficiently complete**, **necessary** construction tests have been performed and accepted, **required** safety-related systems are installed and operational, **relevant** procedures have been approved, and **appropriate** personnel have been assigned and adequately trained."

"The purpose of a **Routine Operation** ARR is to confirm that the facility is **fully ready** for routine operation, including that construction is **complete**, systems are **fully tested** and **operational**, procedures are **established** and operationally verified, staffing is **complete**, and personnel are **fully trained**."

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## Generic Items Readied for ARR

- Procedures
- Administrative controls
- Personnel training and qualification
- Engineered safety systems
- Specific facilities and sub-systems

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## Module 1 Mode of Operation

- Beam will originate from either Tandem
  - TVDG MP-6 provides heavy ions of various species
  - Linac provides protons concurrent with operations for BLIP
- Transport lines deliver beam to the Booster
- Booster accelerates beam
- Beam is debunched in the Booster prior to extraction
- Debunched beam pulses are up to 1 second in length
- Beam travels the 100-m beam line to the BAF beam dump

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## Operational Controls and Safety Systems

- Controls for the beam will be via the Main Control Room
- Module 1 safety systems include:
  - Beam crash
  - Access control gates
  - Radiation monitors
  - Critical devices
  - Fire alarms
  - Tunnel smoke ventilation system

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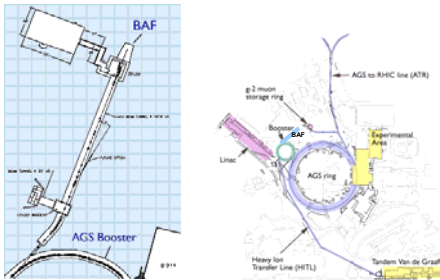
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## Specific Facilities

- Experimental Support Building (B958) that contains:
  - Laboratory space
  - Dosimetry control
  - Communication with the MCR
- Power Supply Building (B957) that contains:
  - Magnet power supplies
  - Instrumentation electronics for the beam line
  - Instrumentation electronics for cooling water systems
- The beam line tunnel (B956) that contains:
  - Entry labyrinths
  - Target Room
  - Beam stop

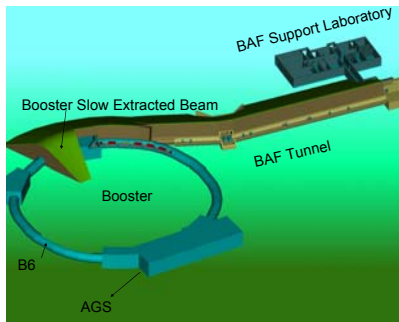
## Plan View of BAF and Injectors



## Sub-Systems

- Scheme for Slow Extracted Beam from Booster
- Booster dump and catcher at Booster B Section
- BAF magnets, power supplies, vacuum system
- BAF cooling water systems
- BAF experimental area:
  - System for inserting samples into Target Room
  - System for controlling exposure of samples

## Plan View of Booster Changes



Brookhaven Science Associates  
U.S. Department of Energy

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BROOKHAVEN  
NATIONAL LABORATORY

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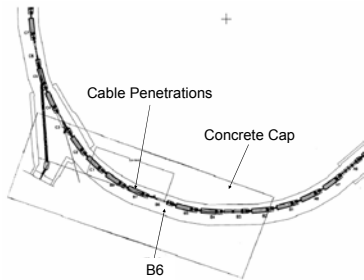
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## Plan View of Booster Concrete Cap



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## ARR Committee Drivers

- First ARR module starts August 1, 2002
  - C-AD achieves readiness for BAF commissioning
  - ARR committee report by September 1, 2002
  - Earliest commissioning date is > October 7, 2002
- Second ARR module starts January 1, 2003
  - C-AD commissions additional experimental equipment
  - ARR committee report by February 1, 2003
- Third ARR module starts March 1, 2003
  - C-AD achieves readiness for BAF routine operation
  - ARR committee report April 1, 2003

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## First Module Mission

- Booster extraction equipment commissioned
- Beam ejected into BAF line
- Booster dump/catcher commissioned
- Beam dump at end of BAF commissioned

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## Construction of Facilities, Module 1

“That construction is **sufficiently complete, necessary**  
construction tests have been performed and accepted”

- Andy McNerney and Dave Phillips will discuss
- ASSRC items discussed by Woody Glenn
- BORE items discussed by Ray Karol

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## BAF BORE Status, Module 1

- **Building 956**
  - All items closed
- **Building 957**
  - Pre-Occupancy – all closed
  - Post Occupancy – one open (pad CT edges)
  - Recommendations – all closed
- **Building 958**
  - Pre-Occupancy – all closed
  - Post Occupancy – three open (2 FP test records, tray bonding)
  - Recommendations – two open (use of photographic chemicals)

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## Access Control System, Module 1

“Required safety-related systems are installed and operational”

- Critical devices reviewed and approved by RSC
- Neville Williams will discuss

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## Procedures, Module 1

“Relevant procedures have been approved”

- Emergency procedures are not applicable for Module 1
- Appropriate operations procedures (P. Ingrassia)
- Fault Study Plan (A. Rusek)
- RSC Check-Off List (A. Rusek)
- ASSRC Check-Off List (A. McNerney)
- Accelerator Safety Envelope (E. Lessard)
- Sweep procedures (P. Ingrassia)

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## BAF and Booster Documents

[http://www.rhichome.bnl.gov/AGS/Accel/SND/baf\\_sad.htm](http://www.rhichome.bnl.gov/AGS/Accel/SND/baf_sad.htm)

[http://www.rhichome.bnl.gov/AGS/Accel/SND/booster\\_sar.htm](http://www.rhichome.bnl.gov/AGS/Accel/SND/booster_sar.htm)

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## Training and Qualifications, Module 1

- “**Appropriate** personnel have been assigned and adequately trained”
- John Maraviglia will discuss

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## Training Status for Module 1

- Radiation Worker 1 Training (TLD)  
**Status: Staff maintains on an ongoing basis**
- C-A Dept Access Training  
**Status: Staff maintains on an ongoing basis**
- Main Control Room (MCR) Operator Training on OPMs  
**Status: Procedures being developed - training to follow**
- Review (and sign-off) of current Standing RWP for Radiation Areas  
**Status: Staff maintains on an ongoing basis**
- Registration (scanning the iris) and Training for Iris Reader Access  
**Status: To follow installation but not required for Module 1**

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## Second Module Mission, 1-1-03

- Heavy ions transported to targets
- Experimental equipment and procedures tested

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## Third Module Mission, 3-1-03

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- BAF commences routine experimental running

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## Next Steps

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- Individual meetings
- Tours

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## **Appendix 5**

### **Summary Reports of ARR Team Members**

# ARR Evaluation Form

**Topics:** Accelerator Safety Envelope, Operations Procedures

**Date:** 9/3/02

## **I. Evaluation Criteria:**

The following topics will be assessed by conducting interviews, document reviews and inspections.

A. What operations procedures exist for BAF? Does the set of procedures cover all of the functions required for Phase I commissioning?

B. Which personnel are required to receive training in these procedures, and have they received such training?

C. What procedures and other mechanisms ensure that the proposed activities under Phase I will remain within the bounds of the BAF Accelerator Safety Envelope?

## **II. Records Reviewed:**

BAF Safety Assessment Document

BAF SAD USI: Critical Devices (4/9/02)

BAF Accelerator Safety Envelope (Proposed, 6/15/01)

C-A OPM 2.5.3 BAF Accelerator Safety Parameters

C-A TPL 03-01 Temporary Procedure to Ensure Compliance with the BAF Energy-Flux ASE

C-A OPM 4.44 Operation of PASS

C-A OPM 4.41 Controlled Access

C-A OPM ATT 2.6.1.c Booster CA LOTO

C-A OPM ATT 2.6.1.d Booster RA LOTO

C-A OPM ATT 2.6.4.g Power Supply

C-A OPM ATT 4.56.bb BAF Stub Tunnel (Z3) Sweep Checklist

C-A OPM ATT 4.56.bc BAF Transport Tunnel (Z2) Sweep Checklist

C-A OPM ATT 4.56.bd BAF Experimental Area (Z1) Sweep Checklist

C-A OPM ATT 4.56.be BAF Berm Sweep Checklist

C-A OPM ATT 4.56.f Booster Sweep Checklist

Commissioning and Acceptance Plan for Operation of the Booster Application Facility

BAF Commissioning Tasks (web document, see below)

## **III. Interview(s) Conducted:**

P. Ingrassia – Operations Manager (8/12/02)

E. Lessard – ES&H Coordinator (9/3/02)

## **IV. Sites Visited:**

Main Control Room, Building 901

BAF Facility, tunnel and support Buildings 956 and 958

## **V. Discussion of Results:**

Procedures for access control, sweeping, and LOTO have been drafted and await approval before training of affected personnel can be done. This set of procedures adequately covers the operational aspects of BAF Phase I commissioning. Other ARR panel members have already noted the need to complete this process before start-up and brought it to the attention of CAD management, including the need to supply the ARR team with a roster of operations personnel with assignments, so that their training status can be evaluated. I requested an update from Pete Ingrassia on 9/3/02.

The "Commissioning and Acceptance Plan for Operation of the Booster Application Facility", 2/15/02, is in fact a valid acceptance plan but contains no information about the actual activities to be performed during the commissioning phases. At most, it details administrative responsibilities pursuant to readiness for review. Therefore, it is my opinion that it does not serve the role of a commissioning plan, which should outline the tasks involved in start-up of the facility and include the fault study plan (at least by reference). A succinct outline (<http://www.rhichome.bnl.gov/AGS/BAF/Commissioners/bafstartuptasks.html>) already exists for the CAD staff performing the commissioning; it should be described in non-specialist's terms and combined with the fault study plan.

Procedure C-A OPM 2.5.3, "BAF Accelerator Safety Envelope Parameters", assigns responsibilities for compliance with specific aspects of the ASE to various job functions. ASE violation is a reportable occurrence. Another procedure (TPL 03-01) exists to ensure compliance with the ASE energy-flux limits (ASE Sect. 3.1-3.4, OPM 2.5.3 Sect. 5.1). This procedure also applies to beam loss control requirements (ASE Sect. 3.5-3.7, OPM 2.5.3 Sect. 5.2) because the method of compliance will be to count the number of pulses (per E. Lessard). In OPM 2.5.3 sections 5.5 and 5.8, the Access Controls Group Leader and Liaison Engineer are required to ensure that certain devices are calibrated or tested at annual intervals. This compliance method would seem to lean heavily on the "tickler" mechanisms they use to remind themselves of expirations, however, certifications that these systems are within their calibration/inspection period are items on the radiation safety checkoff list which must be confirmed before beam can be introduced.

Parenthetically, it seems questionable that ASE sections 4.7 and 4.8 concerning biosafety cabinet and animal room ventilation belong in the ASE at all since they are not relevant to accelerator operations – they could be captured under 1.3.5 or 1.3.6 safety reviews. Given the consequences of ASE violations it seems an unnecessary risk, but I have been told that other committees wanted it that way.

## **VI. Conclusion:**

The draft operations procedures listed above in Section II cover the necessary areas for Phase I commissioning. There is a need for a real commissioning plan but it doesn't have to be elaborate.

## **VII. Recommendations**

- **Prior to approval for commissioning** all procedures for BAF listed in Section II of this report shall be approved, appropriate personnel shall be trained in the procedures, and documentation of that training shall be provided to the ARR committee.
- **Prior to approval for commissioning** BAF should provide a simple description of the commissioning tasks to go with the fault study plan.

Reviewer: James Wishart (CO) 9/3/02

## ARR Evaluation Form

**Topic: Area & Beam Loss monitoring at BAF**

**Date: 8/15/02**

**I. Evaluation Criteria :**

Chipmunks must be provided which monitor for radiation levels and interlock beam during certain abnormal conditions.

**II. Records Reviewed:**

None

**III. Interview Conducted:**

I met with Neville Williams and Peter Ingrassia to discuss deployment and function of chipmunks in the BAF facility.

**IV. Sites Visited:**

MCR

**V. Discussion of Results:**

Five chipmunks have been committed to the BAF facility. The locations for the chipmunks will be:

- On the berm above the target room
- In the labyrinth leading to the BAF laboratories
- In the labyrinth leading to the truck access
- 2 in the spur tunnel

The 2 in the spur tunnel are deployed to monitor radiation levels when there is personnel access to that area and booster is operating. It is not planned that these 2 monitors will interlock beam when the BAF area is secured. The other three monitors are a part of the BAF security system and will trip the BAF critical devices in an alarm state. The circuitry is installed and available, the chipmunks have not been deployed as yet.

Dose history from the chipmonks is tabulated in MCR and provides information about beam loss patterns during BAF operating periods.

Visual displays of chipmunk conditions and interlocks are available in MCR and a procedure exists for addressing chipmunk alarms and interlocks.

**VI. Conclusion:**

The commitments in the BAF SAD have been met.

**VII. Recommendation**

Deployment of calibrated and tested chipmunks must be confirmed prior to ARR sign-off.

Reviewer: W.R. Casey

## ARR Evaluation Form

**Topic: Training**

**Date: 8/16/02**

- I. **Evaluation Criteria:** Define how you will verify the topic  
The topics will be assessed by conducting interviews and document reviews. This topic reviews how personnel are trained, specifically on new or revised procedures.
- II. **Documents & Records Reviewed:** List any documents or records reviewed  
1.12, Training and Qualifications Plan  
C-A Training and Qualifications Plan of Agreement (5/25/00)
- III. **Interview(s) Conducted:** List interviews conducted  
J. Maraviglia (8/16/02)
- IV. **Sites Visited:** Identify any areas that were inspected  
N/A
- V. **Discussion of Results:**  
Training is done per the requirements in SBMS and the C-A Training and Qualifications Plan of Agreement. Training is usually based on a JTA. Records of training are entered into the BNL BTMS.  
  
For new and revised procedures, the training is tracked on the "C-A Permanent Procedure Tracking Form for New or Revised Procedures" (See Attached for examples)  
John has already started to map out the required training for the BAF (See attached email from P. Ingrassia to J. Maraviglia.) Because the procedures have not been finalized, no training has actually take place, to date.
- VI. **Conclusion:**  
The process to provide to training is in place, however as mentioned above, the training can't take place yet.
- VII. **Recommendation**  
There should be follow-up that when the procedures are approved, the training is conducted.

Reviewer: Steven Stein



## ARR Evaluation Form

**Topic: Family Action Tracking System (FATS)**

**Date: 8/16/02**

- I. **Evaluation Criteria:** Define how you will verify the topic  
The topics will be assessed by conducting interviews and document reviews. This topic reviews how actions required for BAF are tracked and closed
- II. **Documents & Records Reviewed:** List any documents or records reviewed  
Action Tracking System (<http://ats.bnl.gov/>)  
FATS Assessment Numbers: 524, 790, 920, 1083, 1114, and 1127.
- III. **Interview(s) Conducted:** List interviews conducted  
D. Passarello – Quality Assurance (8/16/02)
- IV. **Sites Visited:** Identify any areas that were inspected  
N/A
- V. **Discussion of Results:**  
All tracking of items needed for D. Passarello tracks the BAF in the C-A FATS.  
All items are being tracked in referenced assessments numbers. There are a number of open action items that were overdue as of this date. (See attached list)
- VI. **Conclusion:**  
A process to track items to closure is in place, however as mentioned above, a number of items are overdue.
- VII. **Recommendation**  
There should be follow-up that to assure that all items in FATS are closed out.

Reviewer: Steven Stein

## ARR Evaluation Form

Topic: Document Control

Date: 8/15/02

- I. **Evaluation Criteria:** Define how you will verify the topic  
The topics will be assessed by conducting interviews and document reviews. This topic reviews how temporary, new or revised procedures are reviewed for adequacy, approved for release by authorized personnel, and distributed to and used at the location where the prescribed activity is performed.

- II. **Documents & Records Reviewed:** List any documents or records reviewed
- 1.2, C-A Documents
  - 1.4.1, Format of C-A Policies
  - 1.4.2, Format of C-A Procedures
  - 1.4.3, Procedure for Implementing New or Revised Procedures, or Canceling Permanent Procedures
  - 1.4.4, Procedure for Implementing or Canceling Temporary Procedures

Tickler File Card No. 200, C-A OPM Review  
C-A Temporary Procedure Processing Form, Temporary Procedure # C-A TPL-03-01  
C-A Permanent Procedure Tracking Form for New or Revised Procedures, C-A OPM # Att. 2.6.1d

- III. **Interview(s) Conducted:** List interviews conducted
- D. Passarello – Quality Assurance (8/15/02)
  - E. Lessard (8/15/02)
  - P. Ingrassia (8/15/02)

- IV. **Sites Visited:** Identify any areas that were inspected  
N/A

- V. **Discussion of Results:**
- OPM 1.2-Defines documents
  - OPM 1.4.1-Details who has to approve procedures
  - OPM 1.4.2 – Details the format of procedures
  - OPM 1.4.3-Details how to generate new or revised procedures
  - OPM 1.4.4-Details how to generate temporary procedures

A review of TPL-03-01, Procedure to Ensure Compliance with the BAF Energy Flux ASE showed that this temporary procedure is being developed per OPM 1.4.4 (See C-A Temporary Procedure Processing Form, Temporary Procedure # C-A TPL-03-01)

A review of Att. 2.6.1d, Booster RA LOTO showed that it is being developed per OPM 1.4.3 (See C-A Permanent Procedure Tracking Form for New or Revised Procedures, C-A OPM # Att. 2.6.1d)

Procedures are reviewed every 3 years, as part of a review of programs (See Tickler Card No. 200). There are only two controlled copies of the OPM- one is kept by the Quality Representative and the other is in the AGS Control Room.

VI. **Conclusion:**

All procedures that need to be developed or revised for the BAF are being done per the appropriate OPM procedures. All procedures are in the process of being approved, but this is appropriate considering were the status of where the BAF is.

VII. **Recommendation**

There should be follow-up that all procedures are approved at the appropriate times.

Reviewer: Steven Stein

## ARR Evaluation Form

Topic: Emergency & Off-Normal Procedures, Unresolved Safety Issues (USIs) and FUAs

Date: 8/14/02

### **I. Evaluation Criteria:**

The following topics will be assessed by conducting interviews, document reviews and inspections.

A. What "facility safety" procedures exist or are being developed for BAF, and do these receive any special designation or review/approval process?

B. Identify those procedures that address off-normal & emergency situations.

- Exist & approved
- Accessible by personnel performing actions
- Training in use of emergency procedures

C. Fire Response Cards – Do they reflect current conditions, etc.?

D. Verify existence of a process for reviewing changes for impacts on hardware, procedures, training and unreviewed safety issues.

E. Facility Use Agreements (FUAs)

### **II. Records Reviewed:**

- C-A OPM 3.0 Local Emergency Plan for the Collider-Accelerator Department
- C-A OPM 3.2 Emergency Procedures to be Implemented By The Local Emergency Coordinator.
- C-A OPM 1.10.1 Procedure for Documenting Unresolved Safety Issues.
- FUAs for Building 956, 957 and 958.
- C-A Local Emergency Coordinator List

### **III. Interview(s) Conducted:**

- R. Karol – C-A Maintenance Coordinator (8/8/02)
- D. Phillips – Liaison Engineer (8/12/02)
- P. Ingrassia – Operations Manager (8/12/02)
- P. Cirnigliaro – Experimenter Training (8/12/02)
- A. Etkin – FUA Point of Contact (8/14/02)

### **IV. Sites Visited:** Identify any areas that were inspected

Toured the following areas:

- Main Control Room

## **V. Discussion of Results:**

### **Emergency & Off-Normal Procedures:**

- R. Karol stated that for the BAF commissioning run, the facility safety related procedures would include those related to Fire Safety and the Sweep Procedures. BAF is essentially being treated as another beam line in that established C-A procedures would also apply to BAF. Emergency procedures related to the animal facility areas (based on the Medical Dept. Animal Facility procedures) are being considered, but are not required for initial commissioning.
- The procedure review and approval process was described; emergency/safety related procedures receive the same level of review/approval as all C-A procedures. The draft versions are forwarded to the various safety/operations/experimental/maintenance groups for review as appropriate. A procedure in the process of being reviewed was reviewed including the "Reviewed By" signature page.
- The emergency response protocol was described along with the roles of the LEC's, Operations Coordinator and CAS watch.
- C-A OPM 3.0 "Local Emergency Plan for the Collider-Accelerator Department" and C-A OPM 3.2 "Emergency Procedures to be Implemented By The Local Emergency Coordinator" were reviewed. OPM 3.0 has been revised to include BAF in section 1.1 Description of Facility.
- Sweep procedures for BAF are in the process of being developed and reviewed. These shall be approved and personnel shall be trained prior to approval for commissioning.
- Discussed role of Experimental Shift Leader and CAS watch with D. Phillips (Alternate BAF LEC). Recommendation: C-A should provide a list of designated Experimental Shift Leader(s) for BAF commissioning and provide documentation of training.
- Discussed Emergency Procedures with P. Ingrassia and toured Main Control Room. Procedures are available on line and a hardcopy is maintained available to control room.
- Viewed both Main Control Room BAF Fire Alarm Panel and C-A alarm display monitors and discussed process for acknowledging/responding to alarms.
- C-A personnel primarily receive training in procedures through a "read & acknowledge" system. Walkthroughs of new areas are provided to specific personnel as appropriate.
- Discussed process for adding the new BAF related alarms and responses (water leak, etc.) to the system. Recommendation: Provide ARR team with documentation (listing) of BAF related alarms incorporated into Main Control Room system and documentation that operations personnel have been informed of new additions.
- Reviewed C-A Department on-line listing of LECs. The list does not include LECs for BAF Buildings 956, 957 and 958. (copy attached)
- Fire Response Cards have been developed for BAF Bldgs. 956, 957 and 958, and are available on-line. These documents identify the LECs, Alternate LECs, Building Managers, and additional points of contact. (Reference attached Building 956 Fire Response Card.) The response cards current state that there are no hazards present and building is still under construction. Recommendation: Response Cards should be revised to reflect appropriate hazards (Example: beam hazards) immediately prior to commissioning.

### **Unresolved Safety Issues (USIs):**

- R. Karol explained the process for screening procedures, facility changes, for Unresolved Safety Issues (USIs). Initiation is primarily based on responsible individual's knowledge of facility and ASE/SAD. USI's are added as supplementary information to the SAD's.
- C-A OPM 1.10.1 applies to BAF procedures and facilities and has been implemented, as demonstrated by the Following USI: BAF SAD: Change in Critical Devices, 4-9-02.

#### Facility Use Agreements (FUAs):

- FUAs have been developed and are available on-line for each of the BAF buildings 956, 957 and 958.
- In the FUA for Experimental Support Building 958, Table 4.1.4 Environmental and Waste Management Concerns, states that work activity associated with the facility does not involve medical waste (e.g., the question is answered "No"). The EMS Process Assessment for BAF identifies both Regulated Medical Waste (sharps) and Non-Regulated Medical Waste being produced in the facility. Recommendation: Revise FUA.
- In the FUA for the BAF Tunnel and Target Room Building 956, Table 4.1.4 Environmental and Waste Management Concerns, states that work activity associated with the facility does not require environmental monitoring (e.g., the question is answered "No"). Due to the potential to affect groundwater, BAF is required to be monitored via ground water sampling wells. Recommendation: Revise FUA.

#### V. Conclusion:

Established C-A Emergency & Off-Normal, and USI processes and procedures apply to BAF. Activities related to BAF are being coordinated and controlled in accordance with established C-A policies and procedures. The recommendations identified below will enhance the identified aspects.

#### VI. Recommendations

- C-A should provide a list of designated Experimental Shift Leader(s) for BAF commissioning and provide documentation of training. **(Prior to Commissioning)**
- Sweep procedures for BAF shall be approved and personnel shall be trained prior to approval for commissioning. **(Prior to Commissioning)**
- Provide ARR team with documentation (listing) of BAF related alarms incorporated into Main Control Room system and documentation that operations personnel have been informed of new additions. **(Prior to Commissioning)**
- Revise C-A Department on-line listing of LECs to include those for BAF Buildings 956, 957 and 958. **(Prior to Commissioning)**
- Response Cards should be revised to reflect appropriate hazards (Example: beam hazards) immediately prior to commissioning.
- Revise FUAs for buildings 956 and 958 to reflect ground water monitoring wells and medical waste, respectively. Review FUAs to ensure other aspects are appropriately addressed. **(Post Commissioning)**

Reviewer: Mark Davis (ESD)

8/14/02

## ARR Evaluation Form

Topic: Environmental compliance issues /controls

Date: 8/21/02

### I. Evaluation Criteria:

The following environmental topics will be assessed by conducting interviews, document reviews and inspections.

A. Design Features identified in section 3.3 of the BAF SAD, designed to minimize hazards and pollution associated with liquid effluents. The evaluation will verify system implementation, acceptance testing and scheduled maintenance/testing. (Reference section 3.3 of the BAF SAD)

- Beam line sump and sump alarms (testing freq & documentation).
- Drain piping in the facility is connected to the BNL Sanitary System & cooling tower blowdown is discharged to storm sewer outfall.
- Floor drains in the animal rooms have covers.
- Cooling water system makeup alarms (controls, testing freq & documentation)
- There are no outdoor tritiated cooling water systems.
- Closed loop tritiated water system.
- Domestic water supply system has back-flow preventers to isolate BAF domestic water systems.

B. The following additional environmental control features will be reviewed:

- Water detection mats under magnets (response procedures?)
- Maintenance procedures associated with tritiated water system (handling/disposal)
- Tritiated water collection tank
- Target Room design – no floor drains

C. BAF ASE Section 4 “Engineered Safety Systems requiring Calibration, Testing, Maintenance and Inspection” item 4.6 states, “Rainwater barriers for activated soil shall undergo annual visual inspection (not to exceed 15 months)”

Do procedures exist to perform this action?  
Do they adequately verify the intent of the ASE?  
Has the action been performed to date?

D. BAF ASE Section 5 Administrative Controls item 5.5.1 states “Monitoring well location and frequency of monitoring shall be reviewed periodically and adjusted based on prior measurement results.”

E. EMS Process Evaluation – Have BAF facilities and processes been evaluated in

accordance with the SBMS Subject Area "Environmental Evaluation of Industrial Processes and Experimental Research".

**Records Reviewed:**

C-A Procedure C-A-OPM 2.19 (Y)  
C-A ATS item 524.3.5 "Tunnel sump design".  
Pipe chases leak tests on 11/27/01; "BAF Heating & Piping Nov. 27, 2001"  
Power Supply Installation Sheet, dated 3/11/02.  
C-A OPM-ATT 8.31.a (Y) General Hose and Fitting Repair/Maintenance Checklist  
FES Procedures and Instructions No. A.14.0; Subject FES Beam Cap Inspection; Issued by: F. Kobasiuk; Date 3/14/01.  
Memo Paquette to Feldman, dated March 6, 2002, Specifications For New BAF Monitoring Well.  
BAF EMS Process Assessment (preliminary draft, dated 7/13/02) (C-A-595-BAF)

**Interview(s) Conducted:** List interviews conducted

M. Van Essendelft – Environmental Compliance Representative for C-A (8/6/02)  
C. Pearson – Supervisor, Facilities and Experimental Support (FES) Group (8/6/02)  
L. Vogt – Water Systems Group (8/6/02)  
D. Passarello – Quality Assurance (8/6/02)  
D. Paquette – ESD Ground Water Monitoring (8/12/02)  
E. Lessard – C- A, Associate Chair for ESHQ (8/12/02)  
D. Phillips – Liaison Engineer (8/12/02)  
R. Grandinetti – Water Systems (8/20/02)  
R. Lee – ESD (8/20/02)

II. **Sites Visited:** Identify any areas that were inspected

Toured the following areas:

- BAF target area and tunnel in Building 956.
- Power Supply Building 957- Equipment/pump room housing magnet and power supply cooling water systems.
- Magnet water sump collection tank – located in pump room mezzanine
- Magnet water sumps in: tunnel & pump room
- Water collection trench in power supply room.
- Pipe chase under berm for magnet water cooling lines (power supply building to tunnel).
- BAF PLC panel in Power Supply room

III. **Discussion of Results:** It is acknowledged that even though the tritium levels generated in the BAF magnet cooling water will be much less than the Drinking Water Standard, the C-A Department has committed to instituting a variety of controls to mitigate the potential for ground water contamination. This commitment to the environment is commended. These controls were evaluated as follows:

**A. Criteria -- Beam line sump and alarms (testing freq & documentation).**

- Both the tunnel beam line and pump room sumps were inspected. Both sumps contain automatic sump pumps and associated alarms that indicate; (1) when sump pump has turned on; (2) sump high water level.
- A leak test of the tunnel sump was successfully performed on 4/25/02. Reference the following attached documentation: C-A ATS item 524.3.5 "Tunnel sump design".
- The sump systems have been operationally tested. There are currently no plans for instituting routine testing of the system.

**B. Criteria -- Drains connected to Sanitary System & Cooling Tower Blowdown Discharged To Storm Sewer Outfall.**

- The drains associated with the following BAF systems were confirmed to be connected to the BNL sanitary system: Cooling tower water system; floor drains and sinks in the Experimental Support Building.
- Conflicting information exists regarding the discharge of cooling tower blowdown to a storm sewer outfall vs the sanitary system.

Recommendation: C-A shall confirm and document the discharge path of the cooling tower blowdown. If it is determined that the discharge is routed to the sanitary system, have ESD evaluate acceptability. (Prior to initial commissioning)

**C. Criteria -- Floor drains in the animal rooms have covers.**

- The function of these covers is not well recognized and documented. (Possibly to ensure animal waste contaminated with short-lived isotopes is not inadvertently washed into the sanitary system?). Recommendations: Document function of drain covers; determine if they should be included in the EMS process assessment; evaluate need for configuration controls to ensure covers are in place before specific activities requiring covers are performed.

**D. Criteria -- Cooling water system makeup alarms.**

- The magnet cooling water system is designed to alarm when the system senses a need for makeup water. Procedures are in place and are designed to have C-A personnel determine the reason for the makeup water (e.g., ensure it is not due to a system leak) and make notifications.
- C-A Procedure C-A-OPM 2.19 (Y) (attached) was reviewed as found to be properly approved and to contain reference to BAF water systems.

**E. Criteria -- There are no outdoor tritiated cooling water systems, and the tritiated system is a closed loop system.**

- The magnet cooling water system was walked down and reviewed. None of the lines were located outdoors. The buildings and areas (Bldg. 956 Target & Tunnel, and Bldg. 957 Power Supply Building) were confirmed to have the following features to control any tritiated water spills:

- Piping areas do not have floor drains.



- Floor areas are designed as containment areas, designed to Suffolk County Article 12 requirements, including having sunken floors and sumps with pumps that will automatically pump water into a collection tank.
- The two pipe chases (8" SCH. 80 PVC) for the magnet cooling water piping between the tunnel and the Power Supply Building were leak tested on 11/27/01. These pipe chases or busses act as secondary containment surrounding the magnet cooling water lines. (Reference attached documentation sheet "BAF Heating & Piping Nov. 27, 2001")
- Closed loop system; no connections or drains to the sanitary system.

**F. Criteria -- Domestic water supply system has back-flow preventer to isolate BAF domestic water systems.**

- All domestic water supply to the BAF domestic water systems pass through a back-flow prevention device that is tested and maintained by Plant Engineering.

**G. Criteria -- Water detection mats under magnets**

- Water detection mats were observed under the magnets near the cooling water connections points.
- Alarmed to BAF PLC panel in Power Supply Bldg. (observed).
- Operationally tested and documented (reference attached example of Power Supply Installation Sheet documenting check, dated 3/11/02).

**H. Criteria -- Maintenance procedures associated with tritiated water system (handling/disposal).**

- C-A OPM-ATT 8.31.a (Y) General Hose and Fitting Repair/Maintenance Checklist (attached) is an approved procedure for maintenance on water systems. This checklist refers to RWPs, contamination checks and transfer of water to approved drum/tank.

**I. Criteria -- Tritiated water collection tank.**

- The Tunnel and Pump Room sumps discharge into an 800-gallon collection tank located in the Pump Room mezzanine. Since the tritium levels in the cooling water systems will be less than the regulatory limit for Drinking Water Standards, the tank is exempt from Suffolk County Article 12 requirements. Current BNL practice is to register exempt tanks with Suffolk County. Therefore, it is recommended that this tank be registered with Suffolk County as exempt. (Post Commissioning)

**J. Criteria -- Target Room design -- no floor drains**

- The target room was inspected and it was confirmed that there are no floor drains.

**K. Criteria -- BAF ASE item 4.6 - Inspection of rainwater barriers for activated soil.**

- FES Procedures and Instructions No. A.14.0; Subject FES Beam Cap Inspection; Issued by: F. Kobasiuk; Dated 3/14/01 was reviewed. (Copy attached)
  - The associated Beam Cap List attachment has been revised to include the BAF Beam Line – Below Grade Membrane.
  - Step 5.4 specifies two criteria to inspect, which appear to satisfy the ASE requirement for a visual inspection.
  - Procedure states that inspections should be performed immediately after each run.
- Does an administrative system exist to verify inspection was performed annually (15 months)? E. Lessard has requested that acceptance/initial inspection of BAF cap be placed on RSC checklist for initial commissioning.

**L. Criteria -- Environmental Monitoring Wells.**

BAF ASE Section 5 Administrative Controls item 5.5.1 states “Monitoring well location and frequency of monitoring shall be reviewed periodically and adjusted based on prior measurement results.”

- One monitoring well currently exists (well 054-08) and requires repair; a second well is scheduled to be installed (well AGS-44) in the near future. Ideally the second well will be operational before commissioning, so that baseline samples can be obtained. (Reference memo Paquette to Feldman, dated March 6, 2002, Specifications For New BAF Monitoring Well)
- Periodic (semi-annual) sampling is to be incorporated into the Environmental Services Division’s (ESD) 2003 Environmental Monitoring Program.
- ESD’s Data Quality Objective (DQO) will be used to assess the sampling adequacy and frequency.

**M. Criteria -- EMS Process Evaluation**

- A preliminary draft of the BAF EMS Process Assessment (dated 7/13/02) was reviewed (Attached). The document is currently being reviewed internally and has not been formally approved. The Process Assessment also describes the NESHAP assessment for air activation products, that was documented in January 2001 for BAF. Note: The outcome of the recommendation regarding the cooling tower blowdown discharge should be accurately reflected in the Process Assessment. All applicable environmental aspects appear to have been captured in this document.

**IV. Conclusion:**

The C-A Department has committed to instituting a variety of controls to mitigate the potential for ground water contamination, even though tritium levels in the cooling water will be much less than the Drinking Water Standard. Hardware, engineered controls and administrative processes are in place to maintain and monitor these controls. The following recommendations will further enhance these areas.

**V. Recommendations**

- C-A shall confirm and document the discharge path of the cooling tower blowdown. If it is determined that the discharge is routed to the sanitary system, have ESD evaluate acceptability. **(Prior to initial commissioning)**
- Add acceptance/initial inspection of BAF cap be placed on RSC checklist for initial commissioning. **(Prior to initial commissioning)**
- Register tritiated water collection tank in Bldg. 957 with Suffolk County as exempt. **(Post Commissioning)**
- Document function of animal room floor drain covers; determine if they should be included in the EMS process assessment; evaluate need for configuration controls to ensure covers are in place before specific activities requiring covers are performed. **(Prior to commissioning experimental equipment)**

Reviewer: Mark Davis (ESD) 8/21/02

## ARR Evaluation Form

Topic: Interlock Plan

Date: 8/16/02

### **I. Evaluation Criteria:**

The following topics will be assessed by conducting interviews, document reviews and inspections.

A. Ensure the design and implementation of the BAF interlock and Access Control systems meet acceptable levels of personnel protection as defined in BNL ES&H Standard 1.5.3.

B. Determine functional status of Access Control system.

C Determine status of documentation and procedures for the interlock system and Access Control functions

- Exist & approved
- Accessible by personnel performing actions

D. Verify existence of a process for reviewing changes for impacts on hardware, procedures, training and un-reviewed safety issues.

### **II. Records Reviewed:**

- Commissioning and Acceptance Plan for Operation of the Booster Application Facility
- C-A-OPM 4.44 (Y) Operation of PASS
- C-A-OPM 4.41 Controlled Access
- C-AD-CSS-C100-0001 Booster Applications Facility Systems, Group Specification
- C-A OPM –ATT 4.56.bb BAF Stub Tunnel (Z3) Sweep Checklist
- C-A OPM –ATT 4.56.bc BAF Transport Tunnel (Z2) Sweep Checklist
- C-A OPM –ATT 4.56.bd BAF Experimental Area (Z1) Sweep Checklist
- C-A OPM –ATT 4.56.be BAF Berm Sweep Checklist
- C-A OPM –ATT 4.56.f Booster Sweep Checklist
- BAF PASS System State Tables for PEER 27
- PASS System PEER 27 sub-system validation logbook
- Booster Applications Facility Auto Cad drawings RD4210001 series

### **III. Interview(s) Conducted:**

N. Williams – Group Leader Access Controls  
J. Reich – Access system software programmer a DIVISION  
P. Ingrassia – Operations Manager  
A. Etkin – CA D ES&H Coordinator

IV. Sites Visited: Identify any areas that were inspected

Toured the following areas:

- Main Control Room
- BAF Experimental Hall

V. Discussion of Results:

In order to complete this exercise several assessment methodologies were employed:

- 1) documentation was reviewed with comparison to BNL ES&H Standards;
- 2) interviews with cognizant CA staff; and
- 3) functional assessment of the system.

**A. Ensure the design and implementation of the BAF interlock and Access Control systems meet acceptable levels of personnel protection as defined in BNL ES&H Standard 1.5.3.**

- Evaluation of the BAF interlock and Access Control systems consisted of a review of the BAF PASS system (PEER 27) against the requirements of BNL's ES&H Standard 1.5.3, Interlock Safety for protection of Personnel. C-A staff members interviewed were knowledgeable of the system as they were involved in design, review and implementation of the system. The Interlock/Access Control system was built using a similar design philosophy as the RHIC PASS system. Some improvements were incorporated into the system to permit greater flexibility without compromising integrity of protective functions. BAF PASS (PEER 27) complies with applicable BNL Standards. **No issues.**

**B. Determine functional status of Interlock/Access Control system (PEER 27).**

- The Access Control Group Leader (ACGL) maintains a logbook (PASS System PEER 27 subsystem validation logbook) of all subsystem validation tests. This logbook is a crucial step in verifying functionality of the PEER 27 system.
- A demonstration of the system was performed to showcase functions of PEER 27. There system responded as expected with one exception. One of the door switches in the system at BAF Gate Exit 1 (BGE1) did not function as expected. In spite of gate door being closed it indicated an "open" status. In discussion with the ACGL it was learned that the switch was not ideally suited for this situation and that other switches were on order. **This door switch and others like it may result in false readings and should be replaced prior to commissioning operation at BAF.**
- The above demonstration of PEER 27 was performed from the MCR. During this demonstration, controls and indicators for the system were evaluated. As a result of operator feedback, this system was designed to look like the existing PASS computer controls in the MCR. **However it was noted that the BAF PASS controls, while similar to the existing PASS controls had greater flexibility; but could have used more on screen information. In addition several of the color schemes of the on screen computer indicators/controls were difficult to read. These Human Factor Engineering issues should be addressed prior to Routine Operation.**

**C Determine status of documentation and procedures for the interlock system and Access Control functions**

- Exist & approved
  - Accessible by personnel performing actions
- A review was performed of the documents cited in section II of this report. The documentation exists and is in the approval process. Once reviewed and approved the documents will be posted in the CA Operations Procedures Manual (C-A OPM) making it accessible to appropriate staff. **A number of these documents were in draft. Prior to commissioning these documents need to be finalized and approved.**

**D. Verify existence of a process for reviewing changes for impacts on hardware, software and procedures.**

- The C-A Department has established protocols for evaluation of hardware and software changes to the Access Control system. These OPMs (4.91 & 4.92) establish configuration control management for the PASS system requiring review and approval prior to changes being introduced in the Access Control system. **No issues.**

**VI. Conclusion:**

Review of the BAF Interlock/Access Control system has verified that due diligence was employed in the design and implementation of the BAF Interlock/ Access Control system. C-A staff members involved in this process are very knowledgeable with years of experience in development and implementation of Interlock/Access Control systems. The PEER 27 and associated documentation comply with BNL Standards providing an appropriate level of protection for personnel.

**VII. Recommendations**

- C-A must review and approve interlock sweep procedures and Access Control documentation for BAF with personnel trained to those procedures. (Pre-start)
- C-A should complete validation of all installed hardware/software functions as designed. (Pre-start)
- C-A should evaluate BAF access control indicators and controls in the MCR for Human Factors issues. (Pre-Routine Operation)

**Reviewer: Terry Monahan**

**8/16/02**

## ARR Evaluation Form

Topic: Maintenance Management

Date: 8/13/02

### **I. Evaluation Criteria**

The following topics will be assessed by conducting interviews, document reviews and inspections.

#### **A. How are maintenance actions scheduled & controlled?**

- a. Walk through/describe process of performing maintenance on the access control system.
  - i. Scheduling
  - ii. Authorization to start work.
  - iii. Notification at end of day & job completion.
  - iv. Work status tracking.
  - v. Post maintenance testing tracking system
- b. Describe electrical/safety systems employed.

### **II. Records Reviewed:**

- C-A Maintenance, Repair and Modification Program – Jobs Scheduling Requests (attached)
- RHIC Maintenance Schedule (attached)
- C-A OPM 2.10 Maintenance Management Policy
- C-A OPM 2.10a C-A Master List of List of Support Groups Who Carry Out Maintenance Responsibilities
- C-A OPM 2.6.8 Procedure for Controlling Equipment Testing.....
- Maintenance Coordinator Work Control Log (attached)

### **III. Interview(s) Conducted:**

- R. Zaharatos – C-A Maintenance Coordinator (8/8/02)
- D. Phillips – Liaison Engineer (8/12/02)
- W. Anderson – CAS Watch Supervisor (8/12/02)
- F. Kobasiuk – ES&F Maintenance Coordinator (Experimental Facilities) (8/13/02)

### **IV. Sites Visited:** Identify any areas that were inspected

Toured the following areas:

- Key Tree for magnet power supplies Power Supply Building 957

**V. Discussion of Results:**

- R. Zaharatos described the work planning and control processes used in C-A. Essentially all work activities are coordinated through Ray or two other individuals as his backup.
- F. Kobasiuk described the work planning and control from the experimental facility perspective. The EF&S Group interacts with the C-A Work Coordinator and Main Control Room to arrange LOTOs and address issues that may affect other parts of the complex.
- Weekly maintenance scheduling meeting are conducted, and a weekly schedule is produced (Example of a Weekly Schedule is attached). The weekly schedule is also available on the web. The various group supervisors, such as ES&F Group, attend the Thursday planning meetings, which coordinate work throughout the entire C-A complex. Each work group then holds their own planning meetings on Friday.
- R. Zaharatos also attends the weekly planning meetings for the individual groups, such as those associated with the BAF project.
- Job request forms are used to request, schedule and plan activities. (Reference attached job request forms identifying installation of BAF new Security System and other BAF tasks)
- The status of work is tracked and coded on the weekly schedule.
- The work group supervisors and work control coordinators maintain Work Control Logs.
- Back shift equipment problems are communicated via phone calls (for urgent issues) and by issuing job requests.
- Per D. Phillips, Plant Engineering is aware of proper individuals to contact (D. Phillips, Liaison Engineer/ Building Manager or F. Kobasiuk, Assistant Building Manager) before performing maintenance action in the BAF buildings.
- The key tree for magnet power supplies, located in Building 957, was viewed and discussed with D. Phillips as an example of safety controls (electrical/LOTO) employed in the facility. Essentially all of the cabinet door keys for a specific power supply must be in the key tree before it will permit release of the key for energizing the power supply.

**VI. Conclusion:**

Maintenance activities are being coordinated and controlled in accordance with established C-A policies and procedures.

**VII. Recommendations**

None.

Reviewer: Mark Davis (ESD)

8/13/02



## ARR Evaluation Form

**Topic: Radiation Safety Committee Check-lists & Fault Study Plan**

**Date: 8/19/02**

I. **Evaluation Criteria** : A satisfactory RSC check-list and Fault Study Plan must be approved prior to ARR validation

II. **Records Reviewed:**

CAD OPM Procedure 9.1.2 – “Preparing and Maintaining an RSC Check-list and Assuring that RSC Recommendations are Completed”

CAD OPM Procedure 9.1.9 - “Fault Study Procedure for Primary and Secondary Areas”

CAD OPM Procedure 9.1.9(C) – “Guidance for a Fault Study Plan”

III. **Interview(s) Conducted** : I met with Adam Rusek, the liaison physicist responsible for the development of the fault study plan and the RSC check-list.

IV. **Sites Visited:** None

V. **Discussion of Results:**

A comprehensive set of procedures exist for the preparation and approval of the RSC check-lists and the fault study plan. Adam Rusek as the liaison physicist for BAF is responsible for the preparation of these documents. At the time of our interview, the documents were in preparation. He indicated that the RSC check-list would be the first document to be issued for comment and that it should be ready for distribution by late August.

VI. **Conclusion:**

A well defined process exists for each document. Responsible personnel are well aware of the requirements and the importance of completing these documents.

VII. **Recommendation**

These documents must be completed prior to the ARR committee validation.

Reviewer: W.R. Casey

## **ARR Evaluation Form**

### **Topic: Radiation Safety Committee Open Items**

**Date: 8/14/02**

**I. Evaluation Criteria :**

A check-list of RSC issues should be developed. All items must be closed prior to BAF commissioning

**II. Records Reviewed:**

Minutes of RSC meetings of 6/22/99, 4/13/00, 8/1/01, and 12/11/01 were reviewed. In addition, an Excell spread sheet prepared by RSC chair listing all RSC items related to BAF was reviewed.

In addition, the following CAD procedures were reviewed:

OPM 9.1.2 – "Procedure for Preparing an RSC Check-Off List and Assuring that RSC Recommendations are Completed"

OPM 9.1.2a – "C-A Radiation Safety Committee Check-Off Items Master Index "

OPM 9.1.2b – "RSC Check-off List Change Control Form (CCF)"

**III. Interview Conducted:**

I met with Dana Beavis to discuss RSC meetings and findings.

**IV. Sites Visited:**

None

**V. Discussion of Results:**

Four reviews of radiation safety associated with BAF operation have been conducted. SAD requirements were not specifically considered in these reviews. A number of items were established from review which must be satisfied prior to operation of BAF. These items will make up the BAF RSC check-list which has not been prepared as yet.

**VI. Conclusion:**

Most items for RSC review are still open.

## **VII. Recommendation**

All open items must be confirmed as closed prior to ARR sign-off. Particularly important are:

- Interlocks on critical devices
- Interlocks preventing high intensity proton operation while BAF configured for beam

Reviewer: W.R. Casey

## ARR Evaluation Form

**Topic: Radiation Safety Committee Check-lists & Fault Study Plan**

**Date: 8/19/02**

I. **Evaluation Criteria** : A satisfactory RSC check-list and Fault Study Plan must be approved prior to ARR validation

II. **Records Reviewed:**

CAD OPM Procedure 9.1.2 – “Preparing and Maintaining an RSC Check-list and Assuring that RSC Recommendations are Completed”

CAD OPM Procedure 9.1.9 - “Fault Study Procedure for Primary and Secondary Areas”

CAD OPM Procedure 9.1.9(C) – “Guidance for a Fault Study Plan”

III. **Interview(s) Conducted** : I met with Adam Rusek, the liason physicist responsible for the development of the fault study plan and the RSC check-list.

IV. **Sites Visited:** None

V. **Discussion of Results:**

A comprehensive set of procedures exist for the preparation and approval of the RSC check-lists and the fault study plan. Adam Rusek as the liason physicist for BAF is responsible for the preparation of these documents. At the time of our interview, the documents were in preparation. He indicated that the RSC check-list would be the first document to be issued for comment and that it should be ready for distribution by late August.

VI. **Conclusion:**

A well defined process exists for each document. Responsible personnel are well aware of the requirements and the importance of completing these documents.

VII. **Recommendation**

These documents must be completed prior to the ARR committee validation.

Reviewer: W.R. Casey

## ARR Evaluation Form

**Topic:** Safety & Health Issues at Booster Applications Facility

**Date:** 8/17/02

### **I. Evaluation Criteria:**

The following topics will be assessed by conducting interviews, document reviews and inspections.

- A. Status of safety reviews performed for the BAF and support buildings.
- B.. Ensure appropriate measures are in place to ensure continued protection of personnel.
- C. Facility Use Agreements (FUAs) and other facility specific information maintained.

### **II. Records Reviewed:**

- FUAs for Building 956, 957 and 958.
- Beneficial Occupancy Readiness Evaluation Report, Building 956: July 10, 2001
- Beneficial Occupancy Readiness Evaluation Report, Building 957: September 13, 2001
- Beneficial Occupancy Readiness Evaluation Report, Building 958: January 10, 2002
- Various communications with ESRC, ASSRC & RSC

### **III. Interview(s) Conducted:**

R. Karol – C-A Maintenance Coordinator  
C. Schaefer – Radiological Control Engineer  
R. Travis – Review Coordinator  
P. Ingrassia – Operations Manager  
A. Etkin – FUA Point of Contact

### **IV. Sites Visited:** Identify any areas that were inspected

Toured the following areas:

- Main Control Room
- Buildings 956 & 958

### **V. Discussion of Results:**

#### **A. Status of safety reviews performed for the BAF and support buildings.**

- Various safety related reviews/inspections were made of the BAF structures. At least three Beneficial Occupancy Readiness Evaluations (BORE) were performed by C-A and SHSD. BOREs are performed to ensure compliance with appropriate building codes and safety regulations. These BOREs ensure

readiness for an organization to begin populating the structure and setting up programmatic equipment; but not to begin operations.

- Internal C-A groups also evaluated issues at the BAF. In reviewing the resultant documentation it was discovered that a number of pre-start issues remain open (e.g., fire detection and suppression systems have not received required certification). A number of internal C-A safety committee evaluations (ASSRC, ESRC & RSC) identified issues that also remain open. **Pre-start issues identified during the BOREs and from the various internal reviews must be closed out prior to permission being granted for commissioning.**
- The ORE is the laboratory process that identifies programmatic issues/findings. Findings from the ORE are divided into pre and post start issues. For industrial facilities this is the process that is used to grant permission for operation. In the case of an accelerator facility it is required as one piece of the ARR process before permission is granted to start operations/commissioning. **Prior to commissioning, all BAF areas (Bldgs. 956, 957 & 958) require an Operational Readiness Evaluation. All pre-start findings from this process must be resolved prior to commissioning.**

**B. Ensure appropriate measures are in place to ensure continued protection of personnel.**

- C-A Department as owner of this structure is responsible for maintaining and posting appropriate facility specific safety documentation. During the initial walkthrough the absence of the green emergency placards was noted. This is a BNL requirement as is maintaining current information on the Fire Rescue run cards. **Post green emergency placard and update F/R run-cards as facility status changes.**
- **The BAF complex must be added to the C-A Tier I Inspection program to ensure ES&H issues are identified and corrected in a timely manner.**
- Issues resulting from operation of the facility should also be addressed (e.g., bonding/grounding of electrical cable trays, magnetic fields characterized.). Appropriate electrical procedures should be in approved prior to any high hazard electrical work.

**C. Facility Use Agreements (FUAs) and other facility specific information maintained.**

- FUAs for 956, 957 & 958 are on-line. These documents should be updated as operating conditions change.

**VI. Conclusion:**

C-A management has well-established mechanisms for evaluating and providing safe working environment for personnel. These processes should provide adequate margin of safety for operation of the BAF. Recommendations below are in process; but must be addressed prior to BAF being granted permission to begin commissioning operations.

## **VII. Recommendations**

- C-A should ensure compliance with all BNL facility requirements prior to approval for commissioning (e.g., hazard placards in place, FUA updated, Fire/Rescue Run cards updated, Tier I scheduling). (pre-start)
- Revise FUAs for buildings 956 and 958. Review FUAs to ensure other aspects are appropriately addressed. (post-start)
- Conduct an ORE of all three facilities prior to commissioning with closure of all pre-start findings
- C-A should generate a listing of all open findings and issues for the BAF and ensure closure of all pre-start findings from the ORE and earlier reviews

Reviewer: Terry Monahan 8/1702